MEASURING ARMS TRANSFERS WITH MULTIPLE ATTRIBUTE UTILITY THEORY

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THESIS

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Multiple Attribute Utility Theory

by

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This thesis explores the theoretical and practical problems encountered in using Multiple Attribute Utility Theory to assign capability measures to military weapon systems. Two experiments were conducted, the first employed the classical form of data representation and the second utilized piecewise linear approximations as a practical alternative. It was concluded that Multiple Attribute Utility Theory appears to be a significant step forward in search for a valid measure of arms transfers.

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Measuring Arms Transfers with Multiple Attribute Utility Theory

by

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ABSTRACT

This thesis explores the theoretical and practical problems encountered in using Multiple Attribute Utility Theory to assign capability measures to military weapon systems. Two experiments were conducted, the first employed the classical form of data representation and the second utilized piecewise linear approximations as a practical alternative. It was concluded that Multiple Attribute Utility Theory appears to be a significant step forward in the search for a valid measure of arms transfers.

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I. INTRODUCTION

Centuries ago, the transfer of arms from one nation to another was a relatively simple process with consequences the average man could easily understand. A bow and arrow involved one man, had an estimable reloading time and could kill up to a measureable distance. Today, however, modern technology has produced a class of weapons whose complexity and sophistication defy the simple, subjective calculations that faced the merchants and analysts of primitive weapons.

One needs something other than intuition or a "gut feeling" to reliably assess the military, political, and economic implications of selling, say, twenty F-15 "Eagles" to a nation in the Middle East. Yet, it is in this arena of reliably assessing military capabilities among third world nations that some of the most pressing methodological problems exist. Dollar valuations, inventory comparison and military utility have all been examined and to date, have not provided a satisfactory indicator of military capability.

As an alternative, Multiple Attribute Utility Theory (MAUT) appears to provide a more consistent estimator. MAUT is an analytic device with roots in the field of economics. It combines a class of psychological measurement models and scaling techniques to distill multi-dimensional alternatives into a single, ratio index.

This thesis will examine the theoretical and practical problems encountered in using MAUT to assign capability measures to weapon systems which take into account the variables that are relevant in a third world context. Research has been confined to the analysis of air-to-air weapon systems but the analogy to other platforms is readily made. All data and results are presented so that further research may begin from this point.

Chapter II reviews some of the dominant methodologies that have appeared to date. It also discusses Multiple Attribute Utility Theory with its pertinent forms and assumptions. Additionally, it introduces the factors considered to be descriptive of fighter aircraft. Chapter III presents a small sample survey in which the necessary data for applying MAUT to fighter aircraft is presented. The data are used to evaluate the F4J "Phantom" with Israeli and Egyptian pilots. The respondents for this survey were experienced aviators who possessed a knowledge of utility curves and their uses. Chapter IV examines a possible alternative to the classical form of data collection. Instead of the required utility curves, piecewise linear approximations are substituted. These approximations contain three critical points and were derived from the responses of 200 members of the Red River Valley Fighter Pilots Association. It is hoped this technique will provide the policy maker with a relatively simple procedure for collecting data and simultaneously broadening his

data base. Chapter V summarizes the major conclusions and observations noted during the course of this research.

II. METHODOLOGIES FOR ASSESSING ARMS TRANSFERS

A. REVIEW OF CURRENT METHODOLOGIES

This section will summarily review the dominant methodologies for measuring arms transfers. These are the dollar value, numerical/inventory comparisons and military capability approaches. It is hoped that this brief discussion will generate an appreciation for the difficulties encountered in reliably assessing arms transfers.

1. Dollar Value Method

In 1969, the Stockholm International Peace Research Institute (SIPRI)[1] began a formal effort to monitor arms flows between the rich industrial powers and the rest of the world. SIPRI employed the dollar-value technique and collected their data "from a wide variety of sources."[1] Basically, analysts employing the dollar-value technique use price to quantify the volume and direction of arms flow. At first glance, this may seem to be a reasonable measure of capability since price infcrmation is understood easily, is measured on a ratio scale (thus enjoying all the properites of the real number line) and is available in most instances. A closer examination, however, reveals four major weaknesses of this method.

a. Inflation and fluctuating exchange rates often precipitate a situation where the increase in arms

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[1] Stockholm International Peace Research Institute, The Arms Trade with the Third World, p. VI, Almquist and Wilksells Boktryckeri AB, Uppsala, 1971.

expenditures corresponds to a decrease in the number of weapons actually transferred. Analysts have attempted to alleviate this problem by adjusting yearly figures to reflect some arbitrary exchange rate. Unfortunately, these fluctuations usually are so rapid they cannot be compensated for and the weapon's true value at the time of the transaction is unclear.

b. Much uncertainty exists regarding cost data for foreign arms transfers -- particularly in communist countries. When this information is lacking or insufficient, a tendency exists to evaluate these figures in terms of Western production costs.[2] As Sivard states, " ... although statistical work on such parity rates is underway, under international sponsorship, the availability of purchasing power parities for a large selection of countries is some distance in the future."[3] Hence, an acknowledged doubt exists concerning foreign cost data and its reliability.

c. In many instances, arms are sold from one nation to another for as little as one-tenth to one-hundredth of their initial cost.[4] Often, the reasons for such favorable terms are:

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[2] The International Transfer of Conventional Arms, p. 1, Washington: Arms Control and Disarmament Agency, 1973.

[3] Sivard, Ruth L., World Military and Social Expenditures 1974, p. 30, WMSE Publications, 1974.

[4] Mihalka, Michael, Understanding Arms Accumulation: The Middle East As An Example, p. 14, University of Michigan (MIMEO), 1973.

(1) the supplier country may be depleting excess stock;

(2) the supplier country may no longer have any use for that particular equipment; or

(3) the transfer of arms may be a rider to a much larger deal.

Clearly, the real cost of such transactions has been obscured by the extremely favorable terms of sale.

d. Finally, price is an unreliable indicator of the qualitative differences in arms. Consider the F-14 and the C5A. They are both examples of costly military systems yet a marked difference exists in their military offensive power. Gross differences such as these need to be discerned if one is to properly assess the true military worth of arms transfers.

2. <u>Numverical/Inventory Approach</u>

With the numerical/inventory approach, countries' capabilities are compared on the basis of their respective inventories, say, of MIGs and Phantoms. In some respects, this approach is more reliable than the dollar-value method since major weapons are difficult to hide and a country's supply of these items are usually public knowledge. However, correlating inventories with capability is difficult because of the qualitative differences among the various weapons systems. Just <u>how much</u> better is an F4E with a pilot from Country A than a MIG-19 with Country B's pilot? Certainly, lessons learned from Vietnam and the two Middle East wars

should confirm the notion that inventory balance sheets are not a reliable indicator of military capability.

3. Military Capability Models

In an effort to overcome the shortcomings of the dollar-value and numerical/inventory methodologies, analysts have employed various indexing techniques for juxtaposing weapons systems along some capability scale [2].

One of the most intuitively pleasing approaches to scaling military capability is the factor analysis technique. This process synthesizes a collection of interval data into a set of summary dimensions and shows the degree to which discrete variables are associated with each summary dimension. Mihalka [3] and Snider [4], proponents of this approach, employ similar hypotheses whereby aircraft are categorized into two summary dimensions. Milhalka considers fighter aircraft to fall somewhere along the two different combat missions of "attack" and "defense" while Snider feels they should be separated into "interception/air superiority" and "tactical support ground attack." After making these a priori decisions about aerial combat dimension, Mihalka and Snider separately factor analyzed various data sets and were able to reduce each aircraft to a single, interval score (an example of Snider's aircraft scores is provided in Figure 1). These interval scores, however, are inherently unstable. This is because there is no natural or fixed origin with interval measures. For example, consider the Farenheit scale used to measure temperature. The "zero"

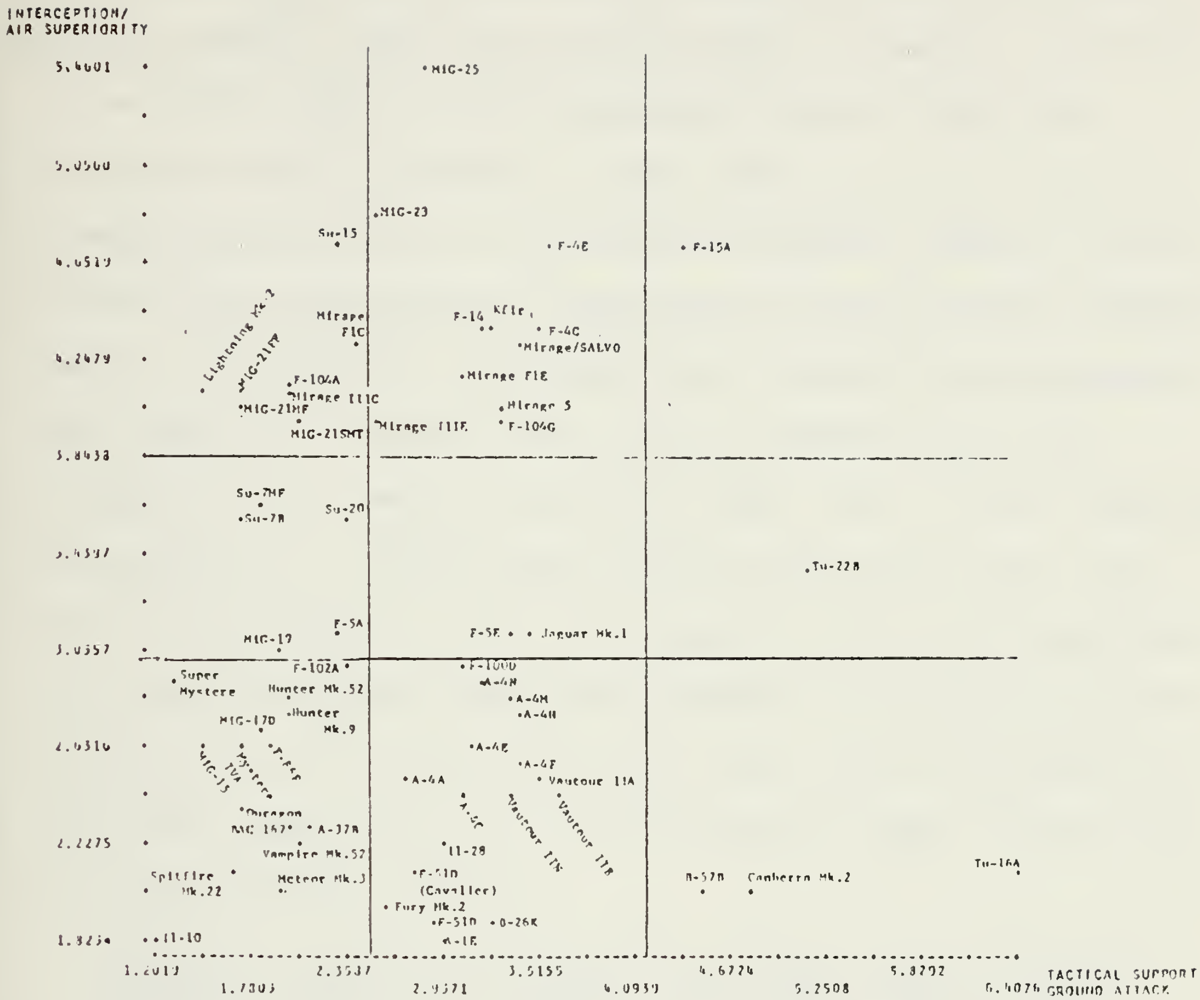

Figure 1. Capability Mix of Principal Combat Aircraft Transferred to the Third World, 1945-1973.[5]

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[5]Snider, L. W., Arabesque: Untangling the Patterns of Supply of Conventional Arms to Israel and the Arab States and the Implications They Have for American Supply of "Lethal Weapons" to Egypt, p. 70, Figure 1, The Claremont Graduate School, July 1976.

for this system was arbitrarily chosen to fall 32 (Farenheit) degrees below the freezing point of water. It could have easily been 31 or 33 Farenheit degrees below the freezing point of helium. Since there is never a lack of temperature, there is virtually an infinite number of zero points for this system or <u>any</u> system using interval measurement. By contrast, techniques that achieve ratio measurement have an inviolate zero point, identical in every respect to the zero of the real number line. Thus, analysts evaluating the various methodologies measuring arms flows must be critical of the theory <u>and</u> the level of measurement that the particular technique achieves. As stated earlier, factor analysis does not produce ratio data and perhaps the problems generated by such approaches are best illustrated by the following example.

> "Consider, first, the process leading to the aircraft inventory capability scores. The first step of this calculation involves adjusting the derived weapons capability scores so that there are no negative or zero values. Mihalka accomplishes this by adding 0.1 (selected arbitrarily) to the absolute value of the lowest factor score and adding the resulting sum to each aircraft score. The effect is to move each system in a positive direction along the interval scale by the amount. Recall that this is permissible with interval measurement since the information is preserved by a linear transformation. Multiplying these adjusted values by varying inventories to obtain composite country scores is tenuous, however ... An example will illustrate this. Suppose the derived factor score for aircraft A is 2.0 and for aircraft B, 1.0, along the offensive dimension. If a country had an inventory of 25 As, the country capability score would be 25 x 2.0 = 50.0. Similarly, if a second country had 50 Bs, its capability score would also be 50.0. Clearly, this would be a situation of parity. Now consider the transformation of the individual factor scores by an arbitrary value of 0.5, i.e., aircraft A = 2.5 and aircraft B = 1.5. Multiplying these adjusted capability scores by the same

country inventories yields a capability score of 67.5 for the first (25 x 2.5 = 67.5), and 75.0 for the second (50 x 1.5 = 75). A situation of equality has suddenly become an advantage for the second country with any change in the number or type of weapons."[6]

In summary, the problem of reliably measuring arms transfers remains unsolved [5]. Thus, new methodologies for solving this problem are constantly being evaluated and one such methodology, Multiple Attribute Utility Theory, is discussed and examined in the following chapters.

B. MULTIPLE ATTRIBUTE UTILITY THEORY

1. Rationale

Theoretically, Multiple Attribute Utility Theory combines a class of psychological measurement models and scaling techniques that can be applied to the decision making process when an assessment of multi-facet alternatives is necessary. Practically, MAUT provides the analyst with a methodology for measuring arms transfers on a ratio scale yet avoids the difficulties encountered by the dollar value, numerical/inventory, and military capability techniques. MAUT does this by first, decomposing weapon systems into their basic elements, second by ascertaining the utility curve and factor weight for each element, and third, by constructing a model to evaluate weapon systems of the same class. Once this process is complete, MAUT enables the

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[6] Legrow, Allan W., Measuring Aircraft Capability for Military and Political Analysis, p. 36, Masters Thesis, Naval Postgraduate School, Monterey, CA, March 1976.

analyst to "score" a particular weapon system, say fighter aircraft, on the basis of its platform design, weapon capabilities, pilot experience and the technical level of the consumer nation. For example, suppose Country A has a fighter aircraft with a score of 10 and Country B has a fighter aircraft with a score of 5. Then Country A has the superior fighter and Country B would need two of their aircraft for every one of Country A's to achieve parity. It should be noted, however, that these indices are only meaningful to aircraft of identical classes. That is, no conclusions can be drawn from an air-to-ground system with a score of 7 and an air-to-air system with a score of 14, since the elements underlying each evaluative model are different.

2. Theory/Application

There are two basic forms [6] to the Multiple Attribute Utility Function and they are:

a. The Multiplicative Form

$$1 + K \cdot U(\overline{X}) = \prod_{c=1}^{N} [1 + K \cdot K_i \cdot U_i(X_i)] \qquad (1)$$

where $U(\overline{X})$ = multi-attributed utility function (In fighter aircraft, $U(X)$ would designate the entire system.)

$U(X_i)$ = the utility function for attribute i

X_i = a specific attribute

K = constant; $-1 \leq k < \infty$

K_i = subjective weight for X_i; $0 \leq K_i \leq 1$ (If attribute i were dash speed, then K_i represents

dash speed's weight or importance to the functioning of the entire system.)

b. The Additive Form

$$U(\overline{X}) = \sum_{i=1}^{N} K_i \cdot U_i(X_i) \tag{2}$$

where $U(\overline{X})$ = multi-attributed utility function

$U(X_i)$ = utility function for attribute i

X_i = a specific attribute

K_i = subjective constant for $U(X_i)$; $0 \leq K_i \leq 1$;

$$\sum_{i=1}^{N} K_i = 1$$

Each form requires the same data for input, that is, a utility curve and a factor weighting for each factor. The different forms reflect the combinatorial relationship the factors bear towards one another. Before discussing the two forms and their attendant properties, a discussion of the data and how they were collected will appear first. The discussion begins with the general concepts encountered in utility theory and concludes with the factor weighting of each factor.

c. Utility Curves

The utility curve is a concept generally encountered in the field of economics. It is a graphic tool that displays the user's preference or utility between alternatives. It entails two basic assumptions, (1) the person who draws such a curve will always act in a rational manner; and (2) this person is aware of his alternatives.[7]

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[7]Henderson and Quandt, Microeconomic Theory, p. 6, McGraw-Hill, 2nd Edition, 1971.

These assumptions have precipitated much controversy in the professional literature. It is often argued that they are naive and unrealistic. The theory, however, does not imply these assumptions always hold, it merely states that _if_ they hold, the derived utility functions are valid. It is up to the person who employs such techniques to determine if the assumptions of rationality apply in a particular analytic situation. For the purposes of this research, it is assumed these assumptions are satisfied where needed.

Mapping utility curves in Multiple Attribute Utility Theory requires a series of difficult decisions. One, in particular, leads to the derivation of ratio measurement, a level of measurement previously identified as crucial in the measurement of arms transfers. To illustrate, a sample curve (Figure 2) depicting the dash speed of a fighter aircraft is presented and discussed.

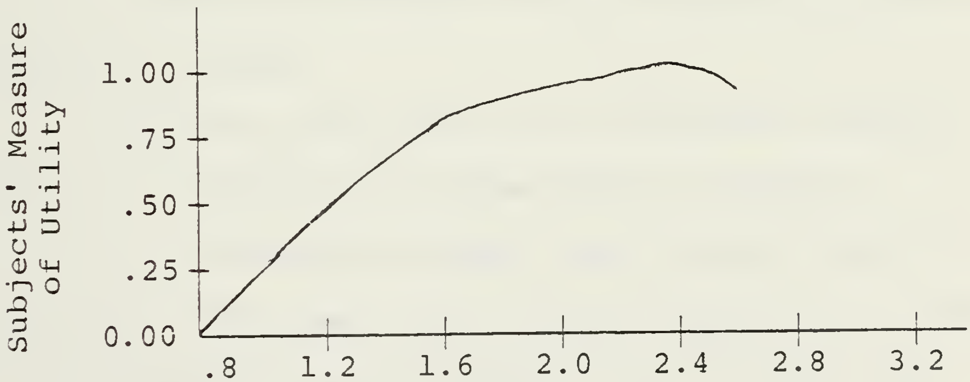

Figure 2. Sample Utility Curve for Dash Speed.

The vertical axis represents the judge's utility scale and is annotated from 0 to 1. Zero implies no utility or value

and 1.0 implies the maximum utility or value. The horizontal axis represents the factor being evaluated. In this case, the factor is dash speed of a fighter aircraft (air-to-air) and the speeds range from MACH .8 to MACH 3.2. An interpretation of this curve would reveal its author felt that if the dash speed of an aircraft was less than MACH .8 it had no utility as a fighter aircraft. In other words, a dash speed less than MACH .8 would be unacceptable in the fighter community. Similarly, a dash speed of MACH 2.4 represents the optimum speed for this factor. Any further increases would be of marginal value. The shape of the curve also conveys much information. The sharp rise from MACH .8 to MACH 1.6 indicates large capability shifts per unit increase in speed. If the vertical scale was changed to dollars, the analogy would infer a greater return on the dollar per unit increase in speed than anywhere else on the graph. Similarly, the slow rise from MACH 1.6 to MACH 2.4 (the optimum) indicates small capability shifts per unit increase of speed.

Deriving such curves is a stringent process. The steps of the process are summarized as follows:

(1) Determine an upper and a lower limit for each attribute. The lower limit should represent the point of class distinction[8] and the upper limit, a value such

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[8]That is, if the attribute were to assume a smaller value it would fall into a different class. For example, if a race car has a lower limit of 120 mph, this would mean any car which could not travel at least 120 mph would not be in the class of race cars, it would be in the class of passenger cars, etc.

that any further increases would only result in marginal returns. The lower limit is crucial since it established the property of ratio measurement. The assumption required is that the lower limit, by definition, represents a "natural" fixed origin. That is, as far as the judge is concerned, this point represents the absolute zero point for the attribute in question. Thus, if the reader considers this a judicious assumption, ratio measurement has been achieved.

(2) The body of the curve is ascertained through a series of probabilistic decisions. For example, if the analyst was attempting to establish the value associated with the 50th utile (i.e., the dash speed that corresponds to .5 on the vertical axis) the analyst would present the judge with two theoretical alternatives, say, A and B. The contents of alternative A are defined by the utile considered and usually represent the extreme cases. Alternative B is defined by the judge (i.e., an expert in the particular field of interest) and the decision for this alternative, when contrasted with alternative A, establishes the desired utile. Using the values of this example, alternative A represents the situation where, if chosen, there is a 50% chance the factor would be designed into an aircraft to reflect the optimum (MACH 2.4) and a 50% chance the factor would be designed into an aircraft at its minimum value (MACH .8). Alternative B, on the other hand, would <u>guarantee</u> the factor be designed into the aircraft at a value of "X". This value of "X" is determined by the judge.

It should reflect a value that renders the judge indifferent between alternative A and B.

Pictorially, the alternatives would appear

A = → 50% chance factor will have the maximum value

or

→ 50% chance factor will have the minimum value

B = → 100% guarantee factor will have some value "X"

The judge must decide what value, if substituted for "X" would make him/her indifferent between alternative A and B. Whatever value is determined for "X" is the 50th utile. In other words, the analyst is making the judge establish the point where the risk involved in alternative A seems equally attractive as the "sure thing" of alternative B. If the analyst were attempting to establish the 60th utile, the alternatives would appear as

A = → 60% chance factor will have the maximum value

or

→ 40% chance factor will have the minimum value

B = → 100% guarantee factor will have some value "X"

(If it was the 40th utile, the probabilities in alternative A would be reversed.)

The judge is informed that "indifference" between alternatives A and B means he/she would accept the flip of a coin to determine whether the consequences of alternative A or alternative B are to establish value of the said factor. The judge is further informed that the ramification of his choice will be reflected into future combat aircraft.

d. Subjective Weights (K_i)

Having the judge subjectively evaluate each attribute's contribution to the overall process entails the second major assumption for ratio measurement. In short, judgmental measurement theory hypothesizes that a definite regularity exists in value judgments. Thus, it is argued that the judge's decision reflect enough precision to achieve ratio measurement. Torgerson [7], however, states that some judgmental measuring techniques such as the subjective estimate and constant sum methods actually produce ratio measurements. Once the judge has evaluated each factor's weight and utility curve, the analyst then faces the task of combining these judgments into a final utility score for the entity being assessed (e.g., fighter aircraft). This is done by determining which, if any, of the following properties have been satisfied. They are, as defined by Giaque[9]:

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[9]Giaque, William C., Prevention and Treatment of Streptococcal Sore Throat and Rheumatic Fever - A Decision Theoretic Approach, p. 10-18, Ph.D. Thesis, Harvard University, November 1972.

(1) Utility Independence. Assume consequence $\bar{X} = (X_1, \ldots, X_N)$ with utility $U(X)$. If $X_{\bar{i}} = (X_1, \ldots, X_{i-1}, X_{i+1}, \ldots, X_N)$, X_i is utility independent of $X_{\bar{i}}$ if the decision maker's relative preference for X_i with $X_{\bar{i}}$ held fixed are the same regardless of the chosen value of $X_{\bar{i}}$.

(2) Pairwise Preferential Independence. This property exists if the choice between two consequences $(X_1, X_2, X_3, \ldots, X_N)$ and $(X_A, X_B, X_3, \ldots X_N)$ does not depend on the values of $X_3, \ldots, X_N$, for all pairs of attributes.

(3) Pairwise Marginality. Pairwise marginality exists if the lottery (choice) $(X_i, X_j), (X_i^*, X_j^*)$ is indifferent to $(X_i, X_j^*), (X_i^*, X_j)$, where lottery A,B is a choice situation with the probabilities of consequence A and B both one-half.

If the first two properties hold, the multiplicative form is used. If all three properties hold, the additive form is used. If none of the properties can be established, the technique is invalid. However, Keeney suggests the additive form may be applied to the data as this form provides a good approximation of the multiple attribute utility function.[10]

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[10] Keeney, R. L., Multidimensional Utility Functions: Theory, Assessment and Application, p. 23-25, MIT, October 1969.

3. Factors Describing Air-to-Air Weapon Systems

It is the intention of this thesis to apply the principles of Multiple Attribute Utility Theory to air-to-air fighter aircraft. As stated in Section 1 of this chapter, the study of any system requires the analyst to decompose the system into its basic elements or factors. The factors used in this study reflect the technical research done by Legrow in which the descriptive factors for fighter aircraft were as follows[11]:

PLATFORM CRITERIA	WEAPON CRITERIA	MISCELLANEOUS CRITERIA
Max Speed (energy)	Range	Pilot Proficiency
Acceleration (T/W)	Missile Speed	Technological Level of the country
Manueverability (W/S)	Missile Envelope	
Endurance (combat radius)	Number of Gun Barrels	

As shown above, the factors contributing to capability are broken into three major dimensions; platform criteria, weapon criteria, and miscellaneous criteria. In the following chapters (III and IV), these factors, excluding the technological level of the country, are presented to experienced aviators in order to ascertain the appropriate utility curve and factor weighting for each factor. All data and results are presented so that further research may begin from this point.

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[11] Legrow, *op. cit.*, p. 122.

III. SMALL SAMPLE SURVEY

This chapter applies the principles and concepts of Multiple Attribute Utility Theory to the problem of reliably assessing arms transfers. This is done by conducting a small sample survey in which experienced aviators were instructed to determine the utility curves and weights for the nine descriptive factors of fighter aircraft, described at the end of the preceding chapter. Section A discusses the main source of data collection -- a two part questionnaire. Section B describes a step-by-step application of the acquired data to the F4J "Phantom" using Israeli and Egyptian pilots. Section C discusses the problems encountered during the course of this experiment in a "lessons learned" format.

A. DATA COLLECTION

A questionnaire (see Appendix A) was the primary source of data collection for this experiment. It consists of two parts, the first ascertaining the factor utility curves and the second, the factor weights. Since the respondents (students at the Naval Postgraduate School) were familiar with utility curves and their uses, the directions for part one are rather straight forward and focus primarily on graph familiarization. There is a short note, however, that instructs the respondent to ignore the relationship the factors bear towards one another as they draw each utility

curve. That is, if the respondent was considering the factor of manueverability, the potential trade-offs between manueverability and, say, dash speed should be ignored. This instruction was intended to establish the property of utility independence for each factor. This property is the only one of the three that either exists or does not exist. The other two properties (pairwise preferential independence and pairwise marginality) involve lotteries (choices) and it was felt these properties were best discussed orally with the respondents.

Part two employs a "pie-gram" to establish the factor weights. The pie-gram (the name was arbitrary) is a subjective measurement technique that employs a "constant sum" method [8]. This method of obtaining the factor weights is important for two reasons: (1) the results of such a method achieves the level of ratio measurement [8]; and (2) the method represents a departure from theoretical purity. That is, the research a priori forces the additive form of the Multiple Attribute Utility Function (MAUF) on the data collected since the sum of the factor weights = 1.0 ($\Sigma K_i = 1.0$), and this, by definition, is the additive form. Thus, even if the multiplicative form was determined to be the correct form, the researcher has biased the data in such a manner that he/she would be unable to use this correct form. The reasons for such a priori biasing were as follows:

1. This researcher feels that every effort to insure ratio data should be pursued by analysts attempting to measure arms transfers. The perils of anything less were clearly identified by Legrow and his rebuttal of Mihalka's interval scores.[12] Thus, the respondents were not simply asked to numerically weight the factor's overall contribution to the process because it was felt this free form of subjective measurement, although yielding unbiased results, entails too large an assumption for ratio measurement. This assumption entails a belief that enough regularity exists in value judgment to measure them on a ratio level. Thus, by more reliable constant sum method, as discussed by Torgerson [7] was deemed a better approach to the subjective weighting of factors at the ratio level.

2. The consequences of forcing the additive form on the generated data are minimal because the measure of weapon systems are comparative and not absolute in nature (this further assumes transformations between the additive and multiplicative forms are consistent). To illustrate, consider a hypothetical situation where the multiplicative form of the MAUF yielded a score of 167 and the additive form yielded a score of 2012. The reader will immediately notice there is a significant difference of one order of magnitude between these <u>two</u> scores, which is precisely the

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[12] See Chapter II, Section A.

point. The reader has compared one against the other and deduces a significant difference exists. If given the value of 2012 alone, how does one ascertain whether this is "good" or "bad?" Thus, as long as the analyst computes the scores in an identical manner, the errors in an absolute sense are irrelevent.

The results presented in the following chapter reflect the above decisions.

B. APPLICATION OF THE DATA TO THE F4J "PHANTOM"

To apply MAUT to fighter aircraft, the analyst must first collect the pertinent factor information on the weapon system being studied.

The data for the F4J "Phantom" were collected from the duty officer of an operational squadron at Naval Air Station Miramar. These data, if not exact, will serve for illustrative purposes and are listed below:

FACTOR	F4J "PHANTOM"
Dash Speed	MACH 1.8
Acceleration (T/W)	.91:1
Wing Loading	92 lbs/sq ft
Combat Radius	500 nm
No. of Gun Barrels	0
Missile Speed	3.5 (Sparrow)
Missile Angle-Off	360° (Sparrow)
Missile Range	24 nm (Sparrow)

Next, the analyst enters the appropriate utility curve with the above information and reads the utility value associated with a particular entry. For example, Figure 3 depicts the resultant dash speed utility curve (the other factor utility curves are located in Appendix B) for this survey. The analyst would enter the graph on the horizontal axis with the "Phantom's" dash speed value (MACH 1.8). Next, a vertical line is drawn from this point upward until it intersects the utility curve. A horizontal line is drawn from this point to the vertical axis and the judge's utility rating for MACH 1.8 is read. In this instance, the value would be .94.

This procedure was applied to the rest of the factors and the F4J "Phantom" scores were as follows:

FACTOR	F4J "Phantom" SCORES
Dash Speed	0.94
Acceleration	0.80
Wing Loading	0.40
Combat Radius	0.80
No. of Gun Barrels	0.00
Missile Speed	0.86
Missile Angle-Off	1.00
Missile Range	0.54

Once these factor scores are obtained, the analyst must determine their combinatorial relationship to each other. As mentioned earlier, this survey a priori forced the results

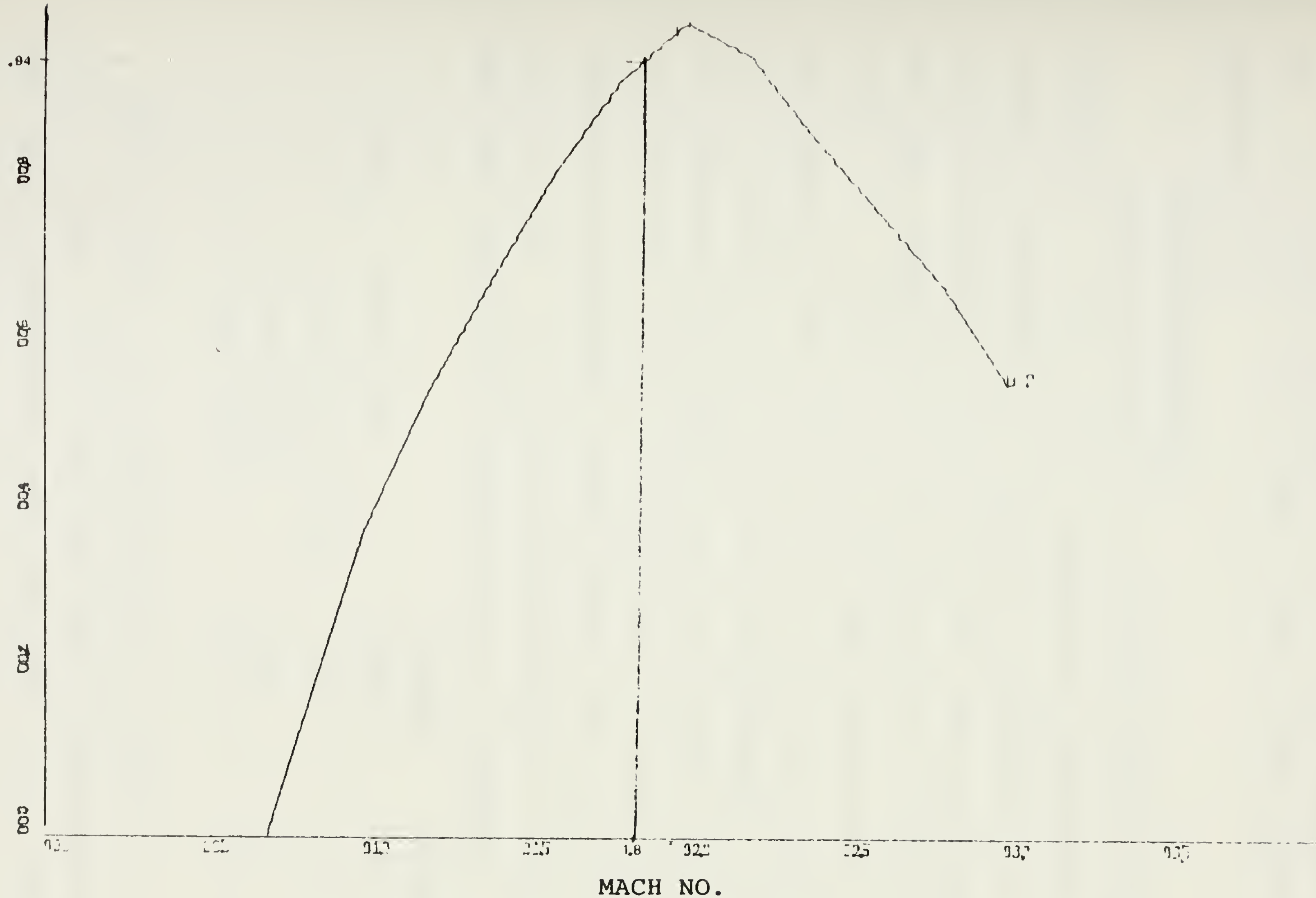


Figure 3. Utility Curve for Dash Speed: Small Sample Survey

into the additive form. The properties are still checked, however, to insure that some form of the MAUF applies. Thus, the analyst checks which, if any, of the following properties hold:

1. Pairwise Marginality

Pairwise marginality is the first property checked because if it holds, utility independence and pairwise preferential independence are satisfied automatically [5]. Pairwise marginality presents the judge with two alternatives and checks whether or not the judge would be indifferent between them. That is, would the judge let the toss of a coin determine which alternative he or she would receive. These alternatives take two factors simultaneously (eventually considering all possible pairs of factors) and presents the judge with a series of hypothetical situations using the maximum and minimum values obtained from the respective utility curves. To illustrate this procedure, a sample case using the aircraft platform factors is presented.

	Minimum	Maximum
Define S = Dash Speed	MACH .7	MACH 1.9
A = Acceleration (T/W)	.4/1	1.1/1
W = Wing Loading	140	19
R = Combat Radius	80 nm	415 nm

The values for the minimum/maximum are obtained from the utility curves. These values were chosen because extreme cases usually precipitate easier decisions for the judge.

Any values between the minimum and maximum are permissible. Once the symbols are defined and the minimum and maximum values set, the judge is presented with a series of lotteries (choices) similar to the following.

	Indifferent between A and B	
Case 1		
Let A = 50% chance the aircraft will have a S = 1.9 (maximum) and A = 1.1 (maximum) and a 50% chance the aircraft will have a S = .7 (minimum) and A = .4 (minimum)	Yes ____	No ____
Let B = 50% chance the aircraft will have a S = 1.9 (maximum) and A = .4 (minimum) and a 50% chance the aircraft will have a S = .7 (minimum) and A = 1.1 (maximum)		

By answering "Yes" in the above lottery, the judge insinuates he would let the toss of a coin determine which alternative, A or B, would govern the factors for fighter aircraft. A "No" answer implies the judge prefers one alternative to the other.

For the following cases, the same "50%" rules apply. The verbage, however, will be omitted and the lotteries will have the following format.

A = (S = 1.9, A = 1.1) or (S = .7, A = .4)

B = (S = 1.9, A = .4) or (S - .7, A = 1.1) Yes ___ No ___

Case 2

A = (S = 1.9, W = 19) or (S = .7, W = 140)

B = (S = 1.9, W = 140) or (S = .7, W = 19) Yes ___ No ___

Case 3

A = (S = 1.9, R = 415) or (S = .7, R = 80)

B = (S = 1.9, R = 80) or (S = .7, R = 415) Yes ___ No ___

Case 4

A = (A = 1.1, W = 19) or (A = .4, W = 140)

B = (A = 1.1, W = 140) or (A = .4, W = 19) Yes ___ No ___

Case 5

A = (A = 1.1, R = 415) or (A = .4, R = 80)

B = (A = 1.1, R = 80) or (A = .4, R = 415) Yes ___ No ___

Case 6

A = (W = 19, R = 415) or (W = 140, R = 80)

B = (W = 19, R = 80) or (W = 140, R = 415) Yes ___ No ___

If the judge answered Yes for all six cases, additivity has been established for the platform factors and the additive form of the multiple attribute utility function is used. The same procedure is then applied to the other factors and the binomial coefficient provides a convenient formula for deducing the number of cases

$$\frac{N!}{R!(N-R)!}$$

where N = total number of factors being considered; R = number of factors being considered at a time. For pairwise marginality computations, R = 2 in all cases.

The respondents of this survey voted against the additive form of the multiple attribute utility function. They felt alternative B always represented a better choice than alternative A. It was felt the risk of receiving the "minimum-minimum" factor combination possible with alternative A left the pilot no chance to develop a successful tactic. Alternative B, on the other hand, always offered a "minimum-maximum" factor combination and it was felt a tactic could be developed to protect the weak factor and exploit the strong one.

If the test for pairwise marginality fails at any point, (which occurs with the first "No" answer) the analyst must then determine if the multiplicative form applies. To do this, pairwise preferential independence is considered first as failure to establish this property automatically implies the multiplicative form of the utility function is not applicable.

2. <u>Pairwise Preferential Independence</u>

Using the definitions and the minimum/maximum values of the pairwise marginality example, the analyst again presents the judge with a series of lotteries. This time, however, the judge's lotteries involve all four factors at once. Basically, choice A fixes two factors at their minimum values and allows the other factors to assume some arbitrary value between their minimum and maximum. Choice B takes the fixed values in choice A and changes the values to the maximum. The other factors assume the same

arbitrary values assigned in choice A. The judge is then asked if his/her choice between A and B depends only on the values assigned to the fixed factors. This procedure is then repeated until all possible pairs of factors have been tested. If the judge's choice is positive in all cases, pairwise preferential independence has been established. This property, however, is insufficient to justify the multiplicative form by itself, therefore, utility independence must be checked. Before discussing utility independence, an example of pairwise preferential independence is presented.

<u>Case 1</u>

Let A = (S = .7, A = .4, W = "X", R = "Y") and

B = (S = 1.9, A = 1.1, W = "X", R = "Y")

the judge is then asked if there are any values for "X" and "Y" (between the minimum and maximum values allotted by their respective utility curves) that could make him/her indifferent between lottery A and lottery B. Those values do not have to be ascertained. It is sufficient to know they exist. If there are none, pairwise preferential independence has been established for these two factors. The analyst must then repeat the procedure until all possible combinations have been exhausted. All pairs must exhibit pairwise preferential marginality to establish its existence.

For this test, the respondents indicated a preference in each case, thereby establishing this property. The reasons were similar to the ones expressed during the test for

pairwise marginality. That is, the respondents felt tactics could be successfully developed better around one alternative than the other. With this property established and given accessible respondents (if the respondents are inaccessible, the analyst must assume the questionnaire's guidance in this area was sufficient) the analyst must then reaffirm the existence of factor utility independence.

3. Utility Independence

Utility independence is established when the judge assures the analyst that the values given for any particular utility curve do not reflect, depend on or relate to the values of any other utility curve. In other words, was the respondent considering the potential trade-offs between attributes, say, dash speed and manueverability, while mapping their utility curves? If not, utility independence has been established.

As a review, pairwise marginality is required for the additive form of the utility function. Pairwise preferential independence and utility independence are both necessary for the multiplicative form. If neither form can be established, Keeney [16] suggests the additive form serves as a good approximation to the utility function. The factors may be grouped in their "natural" setting, as they were for this experiment, (i.e., dash speed, acceleration, wing loading and combat radius, considered together) with a subsequent inter-group check or they may be considered all together. The decision is left to the analyst.

In this survey, the additive form was applied to the data for the previously mentioned reasons. (Note: The technological evaluations for each country are not operative at this point, therefore, scores reflect only the aircraft, the weapons and pilot nationality.)

The results are as follows:

Utility score for Israeli pilots (who have an average of 1000 hours flight time, while Egyptians have an average of 500 hours) in the F4J "Phantom" with Sparrow missile

$= \sum_{i=1}^{9} K_i \cdot U(X_i)$ = [(F4J dash speed score x dash speed weight[13]) + (F4J acceleration score x acceleration weight) + ... + (Israeli pilot's score x pilot weight)]

$= [(.94 \times .12) + (.8 \times .14) + \ldots + (.6 \times .31)]$

$= .65$

Utility score for Egyptian pilots in F4J "Phantom" with Sparrow missile

$= \sum_{i=1}^{9} K_i \cdot U(X_i) = .53.$

Thus, if one assumes equal logistical support, the Egyptians need 1.22 F4Js for every one of the Israelis' to achieve analytical parity. With the appropriate aircraft data, the analyst could evaluate each aircraft in the

---

[13]A list of the resultant factor weights with a brief discussion may be found in Appendix C.

respective inventories to determine each country's air-to-air capability. Once established, future foreign requests for arms could be evaluated against these analytical parity checks.

In the next chapter, the theory is gently stretched in an effort to increase the experiment's sample size. This is important because small sample sizes (e.g., 4, 8, 12, 20) are (statistically) insufficient to establish a high degree of confidence in the results. There is virtually no way of verifying whether the four respondents (for this survey) represent the norm or the extreme. This is not a problem peculiar to multiple attribute utility theory, it is a problem that arises whenever outside (non-textbook) data is fed through an analytical formula. A large sample size, therefore, is a simple but effective way to help alleviate the "garbage in-garbage out" syndrome so often associated with the real world/theoretical model combinations.

C. LESSONS LEARNED

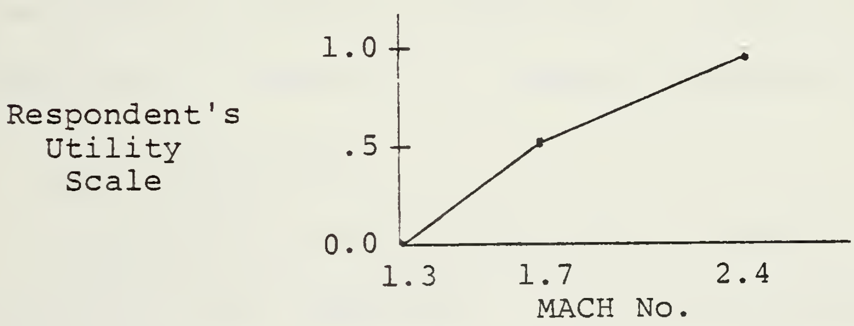
The difficulties encountered with this questionnaire centered on the utility curves and their derivations. Originally, respondents were solicited from the Naval Post-graduate School and the fighter squadrons located at the Naval Air Station Miramar. The respondents solicited at Miramar did not have any prior knowledge of utility curves or their uses. This was not by design, it was more or less a function of the circumstances that brought the examiner

and the respondents together. The explanation of utility curves was not well received and the seven returned questionnaires (out of a possible 30) reflected the anticipated misperceptions. Thus, the sample size was reduced to the four aviators at the Naval Postgraduate School who possessed a knowledge of utility curves and their uses.

It is felt that further classical research should confine its respondents to those with prior knowledge of utility curves and their uses.

IV. LARGE SAMPLE SURVEY

This chapter presents an alternative to a data collection procedure cited in Chapter III. Instead of the required utility curves, respondents would be instructed to identify three points for each factor -- the lower limit, the upper limit, and the 50th utile. These points are identical to their counterparts in the factor utility curves and would therefore retain the relevant properties necessary for ratio measurement. Once the analyst has acquired these points, they would be connected to form a piecewise linear approximation of the actual utility curve. As an example, consider a hypothetical case where the dash speed of a fighter aircraft is reported to have a lower limit of MACH 1.3, an upper limit of MACH 2.4 and a 50th utile of MACH 1.7. The piecewise linear approximation would appear as follows:



Admittedly, the precision of an actual utility curve is lost. It is felt, however, the benefits of such a system far outweigh the disadvantages. These benefits are believed to be: (1) The procedure will significantly broaden the

usable data base. The vast supply of aviators yields relatively few with utility theory training. Under the present system of data collection, this expertise would be lost. With the three point system, all aviators are potential respondents since these values can be ascertained from the "no prior knowledge necessary" type question; (2) with a small sample size, it is extremely difficult (statistically) for the analyst to discern if the respondents reflect the norm or the extreme cases; (3) measuring the capability shifts contingent to an arms transfer is an inherently difficult task as there are many intangibles attendant to such transactions. Therefore, quantitative techniques to evaluate such transfers are approximations at best. Thus, the small amount of precision lost in the three point system is not considered critical by the author.

Section A discusses the questionnaire used to elicit the data. Section B analyzes these data in accordance with the procedures outlined in Chapter III. Section C summarizes respondents' comments in a "lessons learned" format.

A. DATA COLLECTION

A four part questionnaire was the source of data acquisition for this experiment. Part one establishes the lower and upper limits for each factor. The verbage was nontechnical and omitted any reference to utility curves and their underlying concepts. This, of course, was designed to permit respondents with little or no utility theory training or education to respond. The lower limit was intended to

represent the point of zero utility and the upper limit the point of maximum utility. Additionally, instructions designed to (hopefully) insure utility independence were included, similar to the effort in the small sample survey.

Part two attempts to establish the 50th utile for each factor. This was the most difficult section to write as the 50th utile is a counter-intuitive idea to those with no training in this area. The 50th utile may or may not represent the "half-way" point between the upper and lower limits of any particular factor. It all depends on the judge and his subjective opinions of performance versus utility. The questionnaire is located in Appendix D for the reader's scrutiny. Part three of this questionnaire presents a "pie-gram" identical to the one employed by the small sample survey. Thus, the data is pre-biased toward the additive form of the MAUF. Part four was a confidence check by the researcher to establish the respondents' perceptions of how well they felt they understood the questions. They were asked to rate each section on a scale of 1-100 (100 being the best) on the basis of their confidence in understanding the instructions. Respondent questionnaires that indicated a confidence level of less than 60% (arbitrarily) were discarded.

B. APPLICATION OF THE DATA TO THE F4J "PHANTOM"

The vehicle used for analyzing the data was the histogram [8]. It was felt the pictorial display of the data's distribution provided the best tool to establish the single

value necessary for each limit. The particular computer program used (FORTRAN HISTF) to generate the graphics additionally features (1) a sample density function superimposed over the data cells, and (2) twenty-six statistical measures of data location, dispersion and distributional characteristics. Figure 4 displays the histogram analysis of the data received for the lower limit of dash speed (the remainder of the graphics are located in Appendix E). The single value decided upon for each factor's limit was the sample mean. This value was chosen because (1) the difference among the measures of location (mean, median, trimean, etc.) are minimal, and (2) there are a variety of analytical devices (provided the sample is large enough to invoke the central limit theorem) to establish the sample mean's reliability relative to the true population mean.

To illustrate, consider the sample mean for the lower limit of dash speed (MACH 1.36). Using the T-test[14], the analyst could easily establish, say, a .90 confidence interval for the population mean. The appropriate equation is[15]

$$\bar{X} - t_{.95,199} \cdot \frac{S}{\sqrt{N}} < \mu < \bar{X} + t_{.95,199} \cdot \frac{S}{\sqrt{N}}$$

$$= 1.36 - 1.282 \cdot \frac{.421}{\sqrt{200}} < \mu < 1.36 + 1.282 \cdot \frac{.421}{\sqrt{200}}$$

$$= [1.321,\ 1.398]$$

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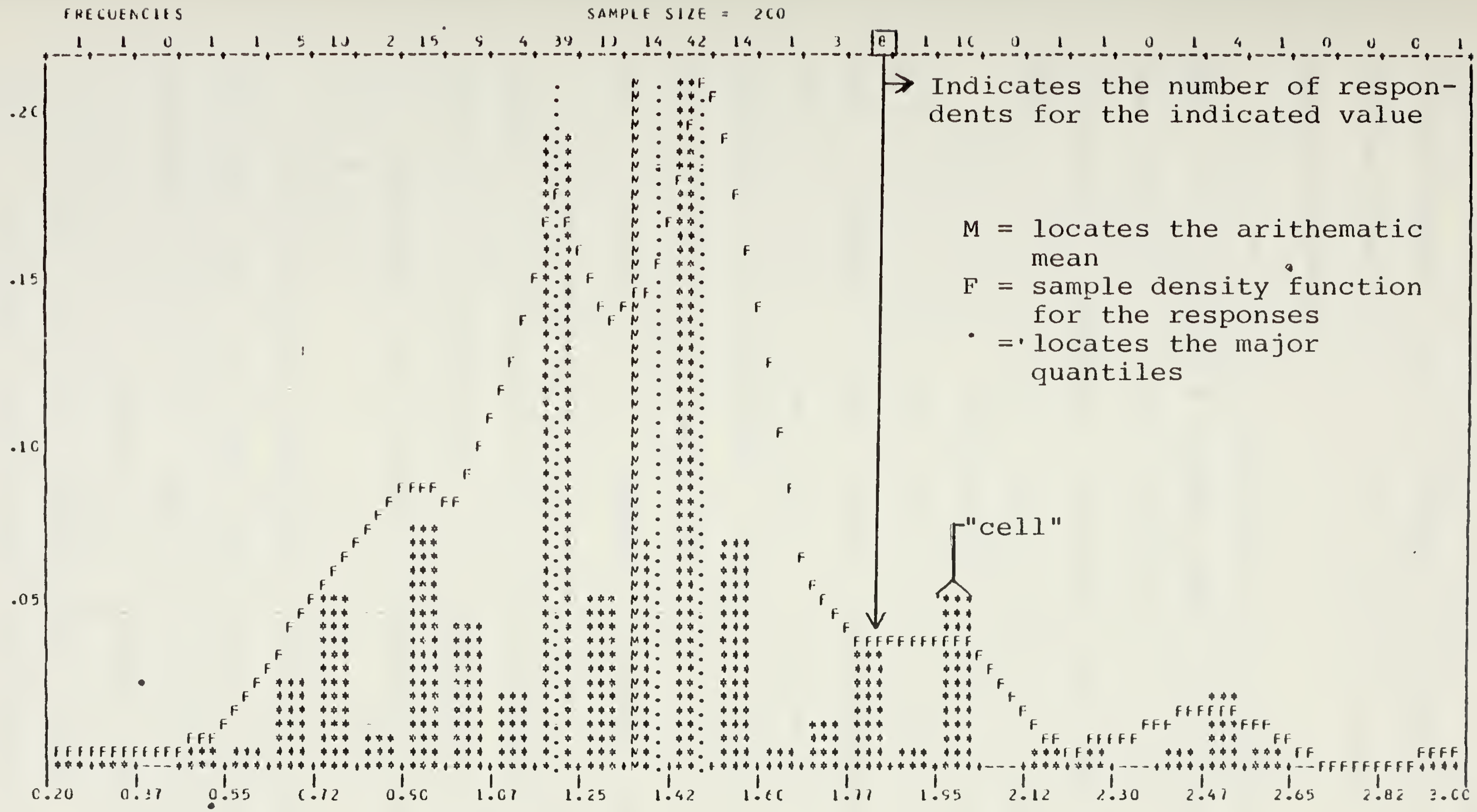
[14] Freund, John E., Mathematical Statistics, p. 274, Prentice-Hall, Inc., 2nd Edition, 1971.

[15] Ibid., p. 274



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.360455E 00	VARIANCE	1.775684E-01	M3	4.673433E-02	MINIMUM	2.000000E-01
MEDIAN	1.400000E 00	STD DEV	4.213887E-01	M4	1.412707E-01	.10 QUANTILE	8.500000E-01
TRIMEAN	1.374999E 00	COEF VAR	3.097309E-01	SKEWNESS	6.245793E-01	.25 QUANTILE (HINGE)	1.200000E 00
MIDMEAN	1.351500E 00	MEAN DEV	3.166000E-01	KURTOSIS	1.480438E 00	.50 QUANTILE (MEDIAN)	1.400000E 00
MIDRANGE	1.599999E 00	RANGE	2.799999E 00	BETA1	4.603565E-02	.75 QUANTILE (HINGE)	1.500000E 00
GEOM MEAN	1.291314E 00	MIDSPREAD	3.000002E-01	BETA2	1.393842E-01	.90 QUANTILE	1.799999E 00
HARM MEAN	1.204504E 00					MAXIMUM	3.000000E 00

LOWER LIMIT FOR DASH SPEED

Figure 4. Histogram: Lower Limit for Dash Speed.

where $\overline{X}$ is the sample mean, $t_{.95,199}$ = .05 tail area of a T distribution with 199 degrees of freedom, S is the sample standard deviation, N is the sample size and μ is the population mean.

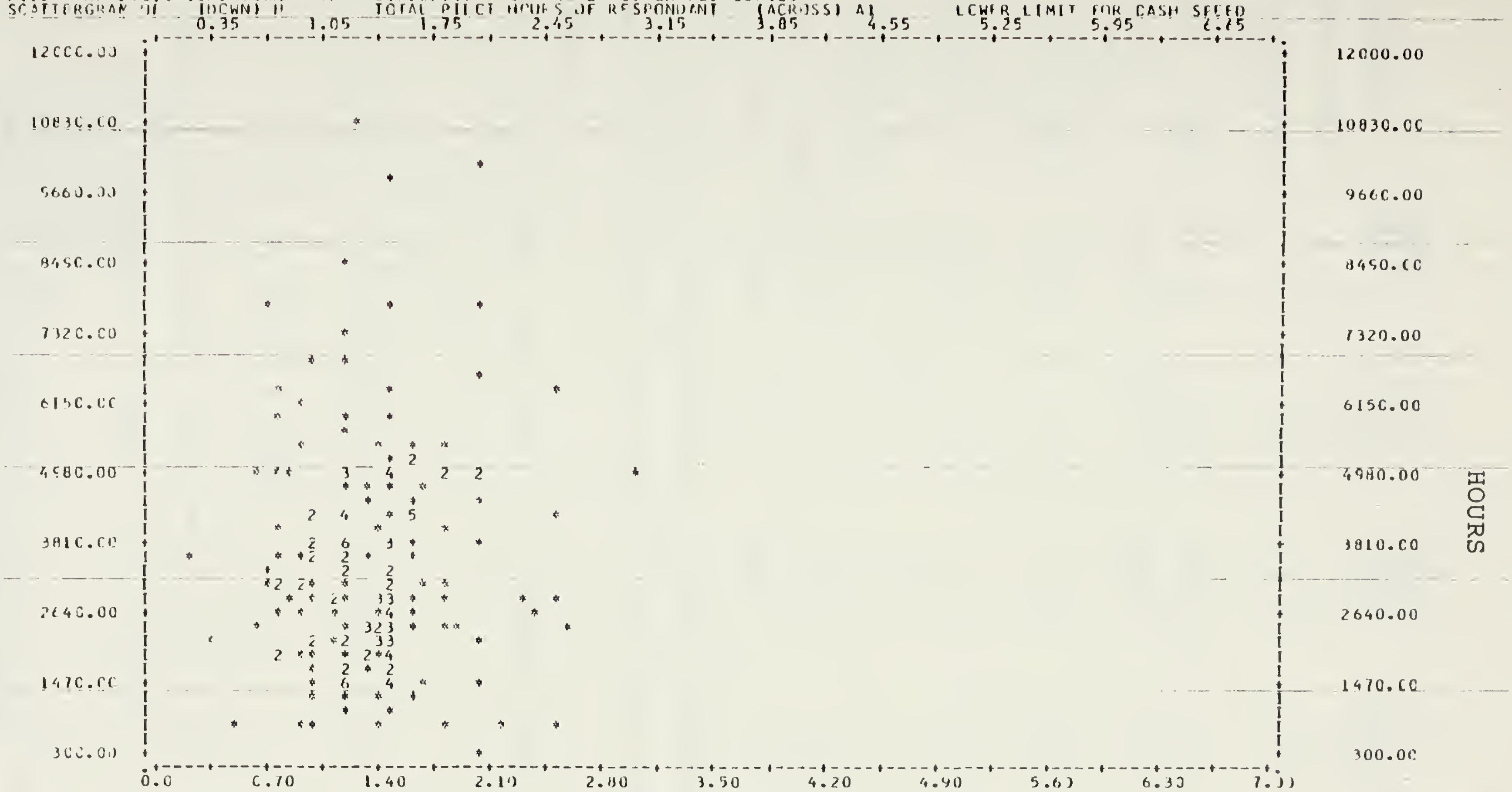
Thus, we are 90% confident that the true population mean falls somewhere between MACH 1.321 and MACH 1.398. The same procedure is easily applied to the other points. From a practical standpoint, the policy maker can be assured his evaluative model gives (statistically) reliable results.

Additionally, a scattergram [10,11] of the respondents' pilot hours versus the factor limits and weights was computed to discern if there was any correlation between the total number of hours accumulated by a fighter pilot and his response to the questions. Figure 5 displays the scattergram of pilot hours versus the lower limit for dash speed. The correlation for the sample regression line was 0.04981, in this case indicating an insignificant relationship between pilot hours and what was considered optimal for the lower limit of dash speed. The remaining scattergrams for this experiment are located in Appendix E along with the histograms.

A table with the resultant values for the lower limit, the upper limit, the 50th utile and the factor weighting are presented below (their resultant utility curves are located in Appendix F). Additionally, the new scores (as opposed to the ones calculated from the small sample survey) for the F4J "Phantom" equipped with the Sparrow missile are included.

LT. PATRICK M. O'CONNELL 07/26/77

FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) A1 LOWER LIMIT FOR DASH SPEED



STATISTICS..

CORRELATION (R)-	0.04981	R SQUARED -	0.00248	SIGNIFICANCE -	0.24238
STD ERR OF EST -	1805.78942	INTERCEPT (A) -	3250.87957	SLOPE (B) -	214.66190
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0

Figure 5. Scattergram: Total Pilot Hours Versus Lower Limit for Dash Speed.

FACTORS	LOWER LIMIT	50TH UTILE	UPPER LIMIT	WEIGHT	F4J SCORE
Dash Speed	1.36	1.8	2.4	.109	.50
Acceleration (T/W)	.91	1.2	1.6	.141	.01
Wing Loading	69.00	55.1	40.3	.134	0.00
Combat Radius	315.00	452.7	648.8	.085	.62
No. of Gun Barrels	3.44	5.2	7.5	.052	0.00
Missile Speed	2.00	2.6	3.8	.059	.88
Missile Angle-Off	77.50	107.9	182.4	.140	1.00
Missile Range	5.10	15.7	32.6	.075	.74
Pilot Hours	533.90	830.2	1486.0	.249	.63(I) 0.00(E)

Reiterating the procedures outlined in Chapter III, the additive form of the large sample data yields the following results:

Utility score for Israeli (I) pilots in F4J "Phantom"

$$= \sum_{L=1}^{9} K_i \cdot U(X_i) = .512$$

Utility score for Egyptian (E) pilot in F4J "Phantom"

$$= \sum_{L=1}^{9} K_i \cdot U(X_i) = .356$$

Thus, the large sample survey suggests the Egyptians[16] need 1.43 F4J "Phantoms" to every 1.0 the Israelis have to achieve analytical parity.

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[16] Again, in the absence of data, the Egyptian and Israeli logistical efforts are assumed equal.

One of the expressed purposes of the large sample survey was to validate the proposed three point utility curve estimator as a statistically reliable tool. Unfortunately, the resultant sample size of the small sample survey (four) was insufficient to apply the available statistical tests to discern if the differences between the two samples were statistically significant. Perhaps a future research effort could gather a larger sample of utility curves for these factors and compare the results with the large sample data presented in this thesis.

If one were to view the results from a non-technical approach, however, the differences between 1.22:1 (the results from the small sample survey implying the Egyptians require 1.22 F4J "Phantoms" to every 1.0 the Israelis possess to maintain parity) and 1.43:1 (results from the large sample survey) are quite minimal. In fact, considering the gross difference in sample sizes, the results are surprisingly close. Perhaps this is suggestive that the respondents in both surveys represent identical populations and value differences are merely a function of the sample size. If these observations are considered judicious the analyst can conclude the three point utility curve estimators are reliable inputs to the multiple attribute utility function.

C. LESSONS LEARNED

The majority of responses indicated a dissatisfaction with three factors -- wing loading, number of gun barrels, and missile range. It was felt that fusilage lift and a

host of aerodynamic changes rendered wing loading invalid as an indicator of a modern aircraft's turning radius. The number of gun barrels was generally received with multiple question marks and comments suggesting the one gun-one barrel concept has been replaced by the Gatling gun. Missile range, it seems, should have been presented in two categories, missile range "close in" and missile range "distant."

Perhaps the comments indicate that measures of aircraft (and other weapon systems) are fluid in nature. No single "once-and-for-all" measure of capability lurks about waiting to be discovered. Accurate evaluation, by any means, requires a continual updating of the factors surrounding a weapon system.

V. CONCLUSIONS

The desire to accurately evaluate the transfer of arms to lesser developed countries is a growing concern among many military planners. Various quantitative techniques have been employed to measure these transfers but to date, none have produced a reliable indicator. This thesis examines Multiple Attribute Utility Theory as a possible alternative. The study has consumed one year and concludes with the conviction that multiple attribute utility theory is a significant step forward in the search for a valid measure of arms transfers. The advantages enjoyed by those who would employ this methodology are perceived to be as follows:

1. MAUT decomposes weapon systems into their basic elements. These elements are classless, measureable and easily understood. Every fighter aircraft has a dash speed and although experienced aviators may not be able to specify what the optimum value should be, they can bracket it.

2. MAUT establishes the weight or relative importance for each of these elements. Thus, different permutations of pilots, weapons and aircraft are easily calculated.

3. The input data for this device is derived from judges with operational expertise. It is not a tool wielded by those who have never seen, sat in or operated the weapon system they are about to judge.

4. As more factors become relevant or capable of measurement (e.g., technological level of the country), the theory allows "newcomers" to be included into the calculations.

5. With two minor assumptions, MAUT achieves the level of ratio measurement. Only with ratio measurement can one say "aircraft A is 1.4 times better than aircraft B."

6. It circuitously quantifies a host of "intangibles." The "intangibles" are an important part of any man-machine interface yet most analysts would be hard pressed to define or quantify these factors. MAUT solves this problem by having pilots evaluate pilots, tank drivers evaluate tank drivers, etc., in a common denominator -- hours of experience. These people may not be able to verbalize their thoughts and feelings about what makes a good pilot or tank driver, but they are considered when the analyst asks them "What is the minimum number of hours you want your wingman, etc., to have?"

The disadvantages of MAUT are:

1. The properties that govern what form of the utility function to use, i.e., how to combine the factors, are difficult to establish. It is suggested this is not as critical a point as it might first appear. The measurement of weapon systems are inherently <u>comparative</u> in nature. It would seem decision makers are not concerned with how good a weapon is absolutely, but rather how good is it compared to what their opponents have. Thus, the small errors that arise from using the incorrect form are irrelevant as long as the same form is used for all computations.

2. The utility curves required of each judge serve to limit the sample size of any experiment and small sample experiments are always suspect. With a minor modification, however, this problem is alleviated and sample size could potentially reflect the entire class of experienced operators.

3. The implications of aggregating responses (i.e., utility curves and factor weights) have not been fully deciphered. Future research should validate this point before MAUT is implemented as a decision making tool.

During the course of this research, some interesting observations were made.

1. The descriptive factors for fighter aircraft used by this study were established by previous research. It seems a reasonable conclusion they were the accepted norm at the time, yet, a majority of the large sample respondents indicated a dissatisfaction with these factors. Perhaps this is an indication that norms or measures of military worth are not fixed but <u>evolutionary</u> in nature.

2. If MAUT is not considered a judicious measurement technique, within its framework lies a potentially useful tool. The "tool" is the knowledge of what fleet personnel <u>perceive</u> to be good. The respondents to the large sample survey may have chosen poor values for each factor, but those values, right or wrong, reflect their perceptions of what is "right." It would seem a knowledge of the fighting man's perceptions are useful data.

APPENDIX A

CHARACTERISTICS OF FIGHTER AIRCRAFT

The ever increasing transfer of fighter aircraft to the lesser developed countries generates a mounting concern among many military planners. The current, quantitative techniques to evaluate the military worth of such transfers often revolve around the budgetary or inventory type models. This research effort intends to expand on the inventory method by including such factors as the maintenance capability of the country, pilot experience and the previously untested concept of comparing their fighters against the "ideal" fighter, a (theoretical) plane designed from the experience of many pilots in the various TACAIR communities that, hopefully, is captured by this questionnaire.

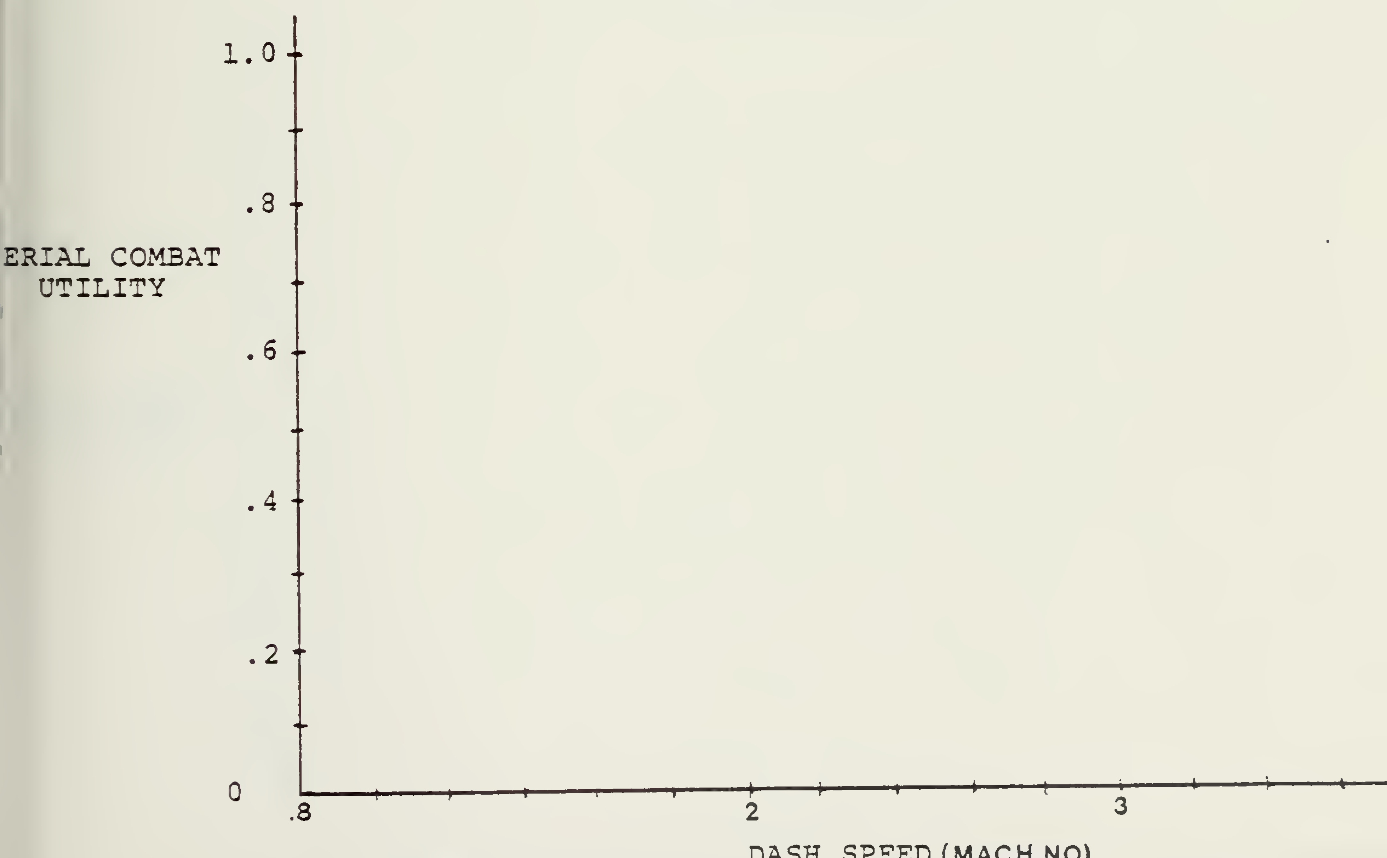
Thus, to complete this survey, you need not remember specific technical features of any particular aircraft. Just respond using your intuition and experience, and remember the survey is concerned with air-to-air performance factors. Please work independently as cross comparisons with other participants will invalidate the subsequent mathematical tests.

SECTION I TOTAL PILOT HOURS ________

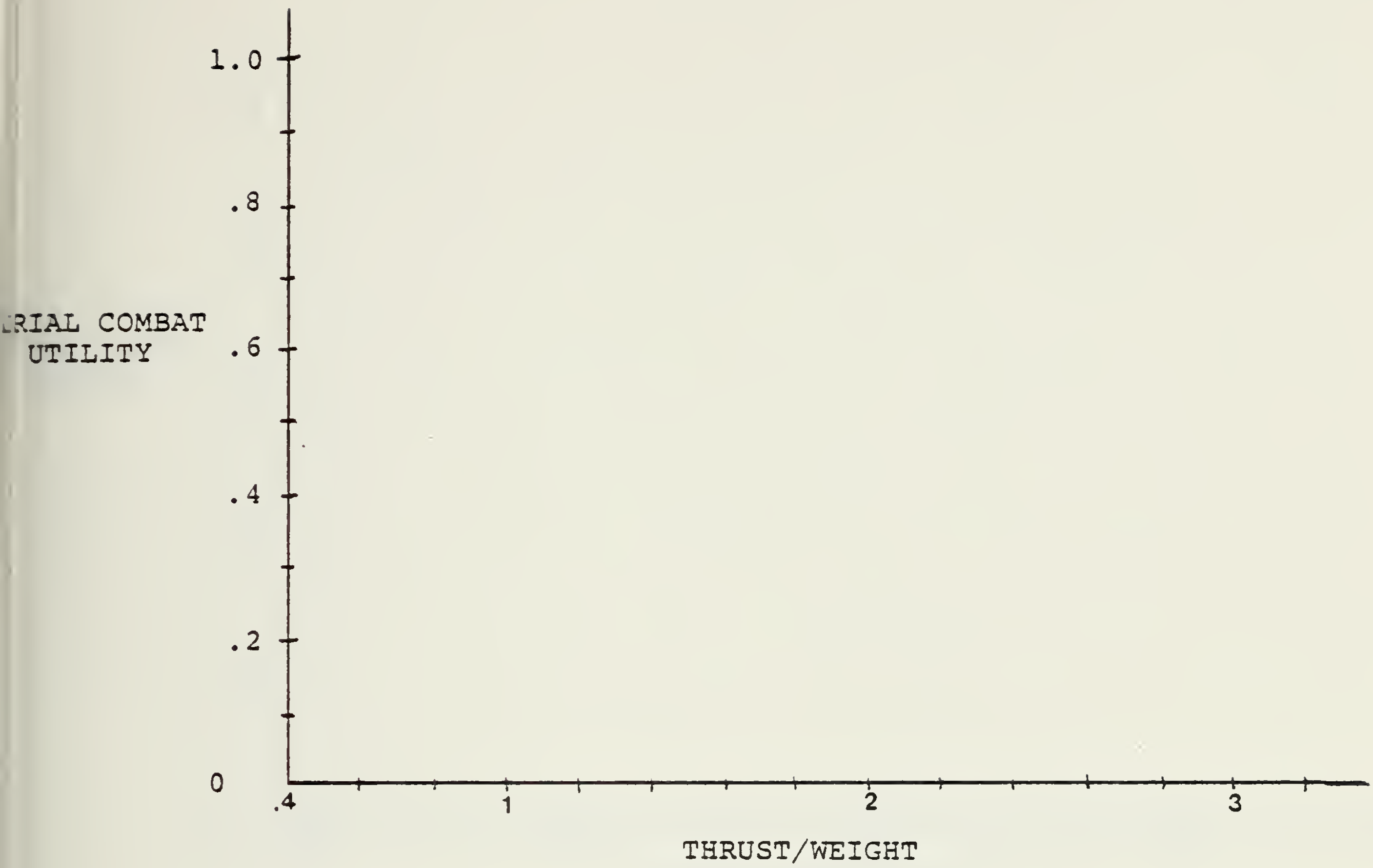
AIRCRAFT FLOWN ____________ BRANCH OF SERVICE ________

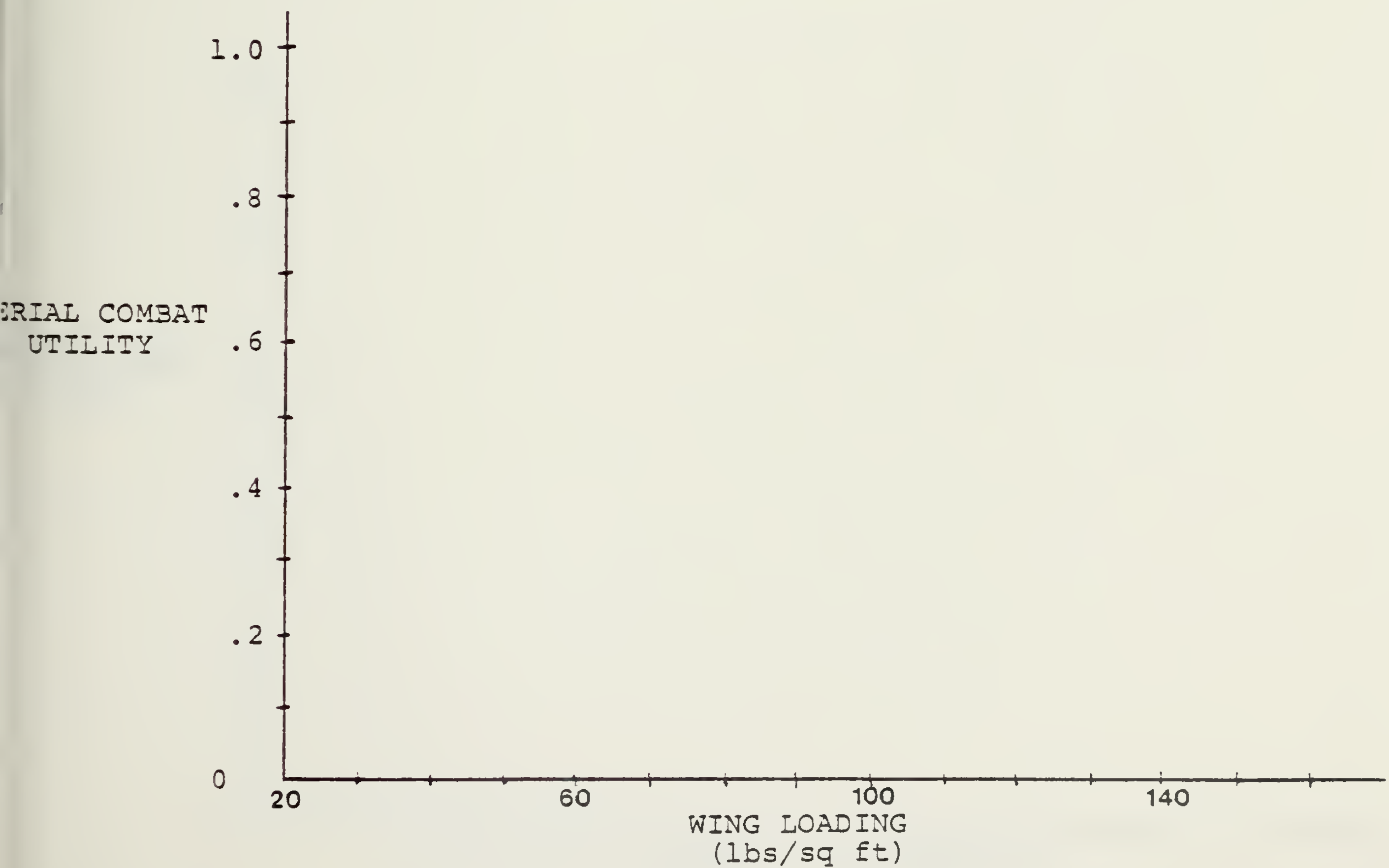
Below are a number of factors describing aircraft performance. Previous research has identified these characteristics as a reasonably complete way of classifying aircraft. Your task for this section is to draw a utility curve for each factor, keeping in mind this survey is only concerned with the factor's relationship in aerial (air-to-air) combat.[1] Each curve should begin at the point of zero utility and at least pass through the point of maximum utility. The vertical scale represents "utility" and is annotated from 0 - 1.0, 1.0 representing maximum utility. The horizontal scale represents the factor and is annotated in the appropriate units.

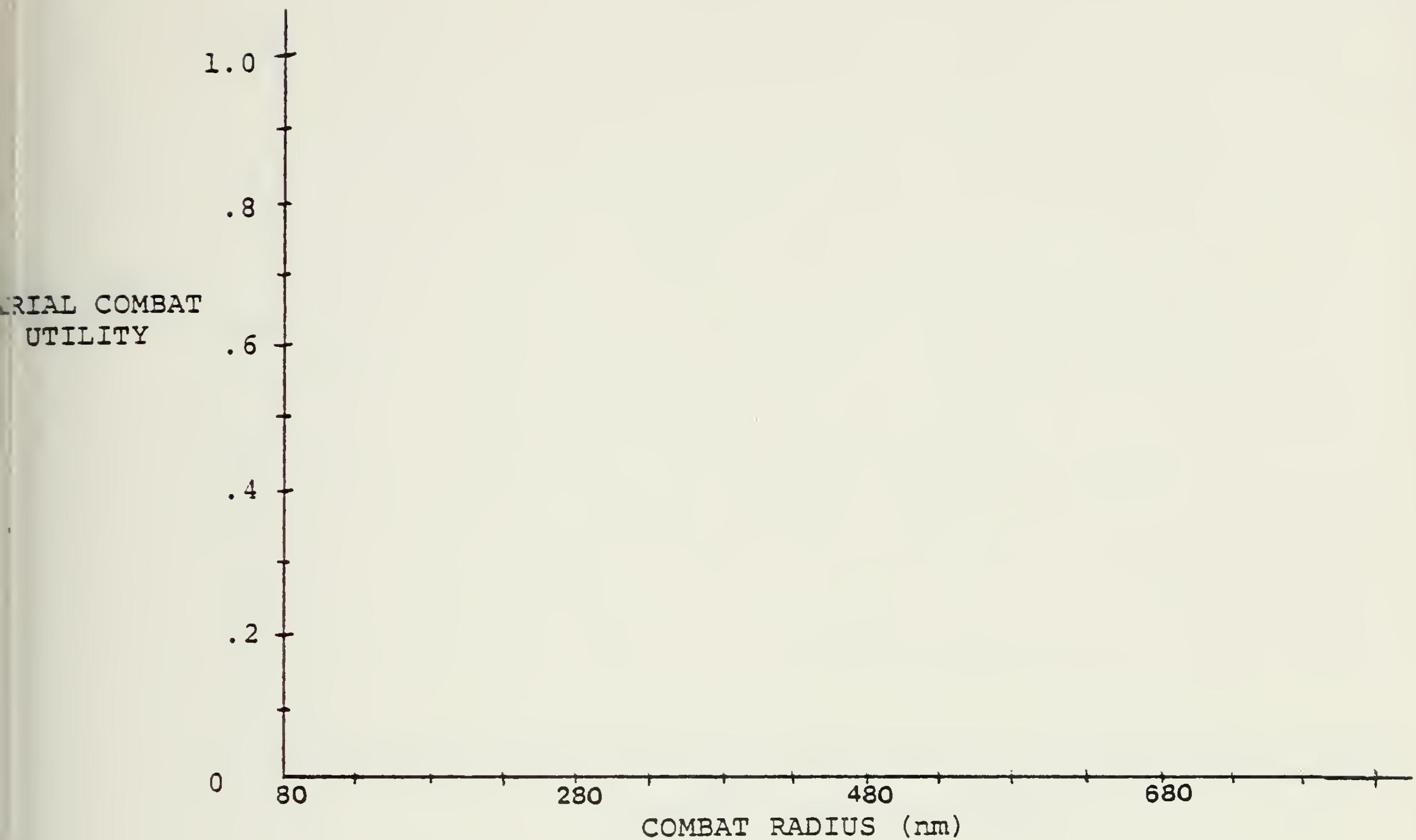
When considering these factors and their utility curves, try to consider each one individually, ignoring its effect or relation to any other factor. Admittedly, this is not possible in the real world for one factor (say manueverability) is always considered in terms of other factors (i.e., wing loading, top speed, etc.) but for now, assume we have some magic process that can incorporate one factor at no consequence to another.

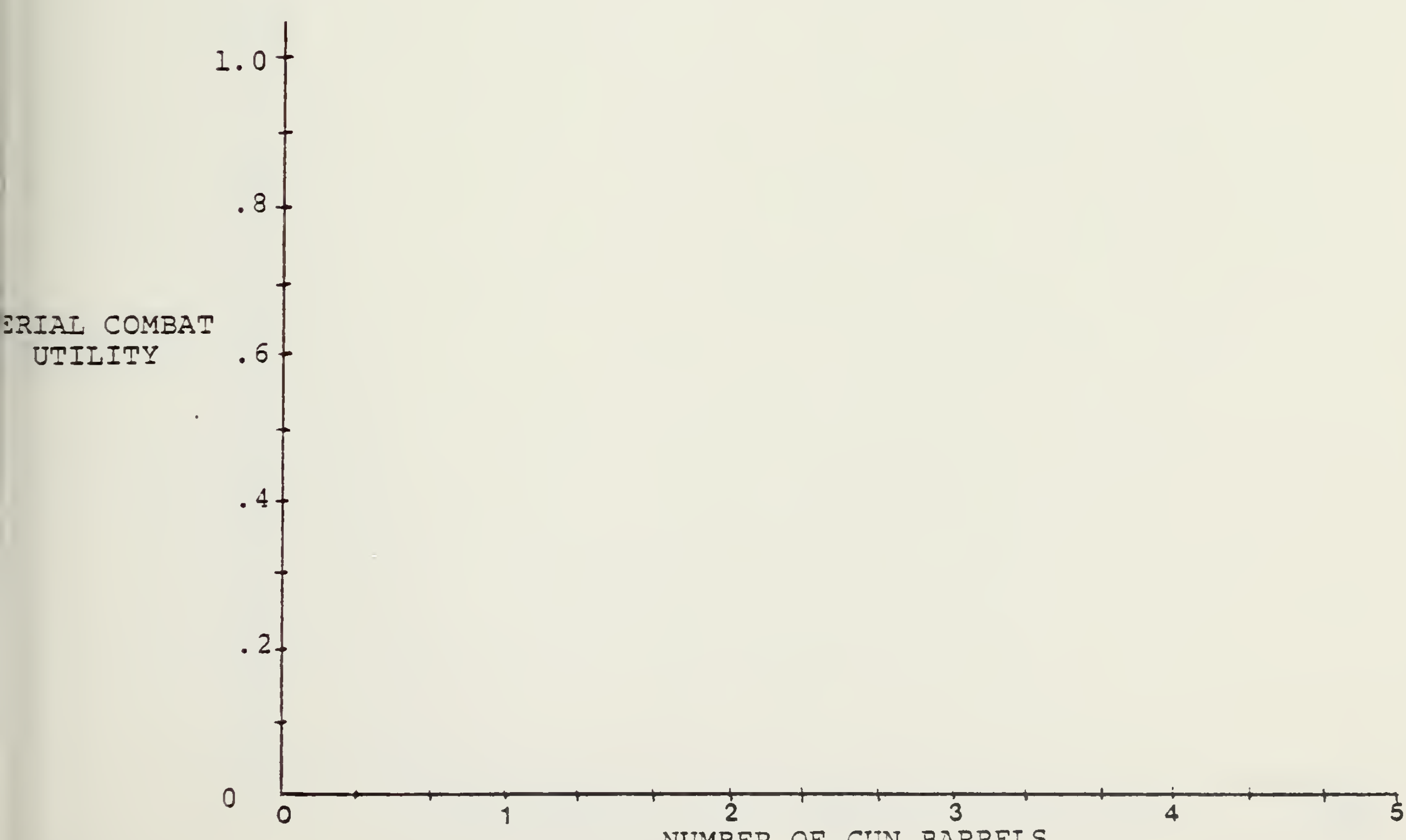


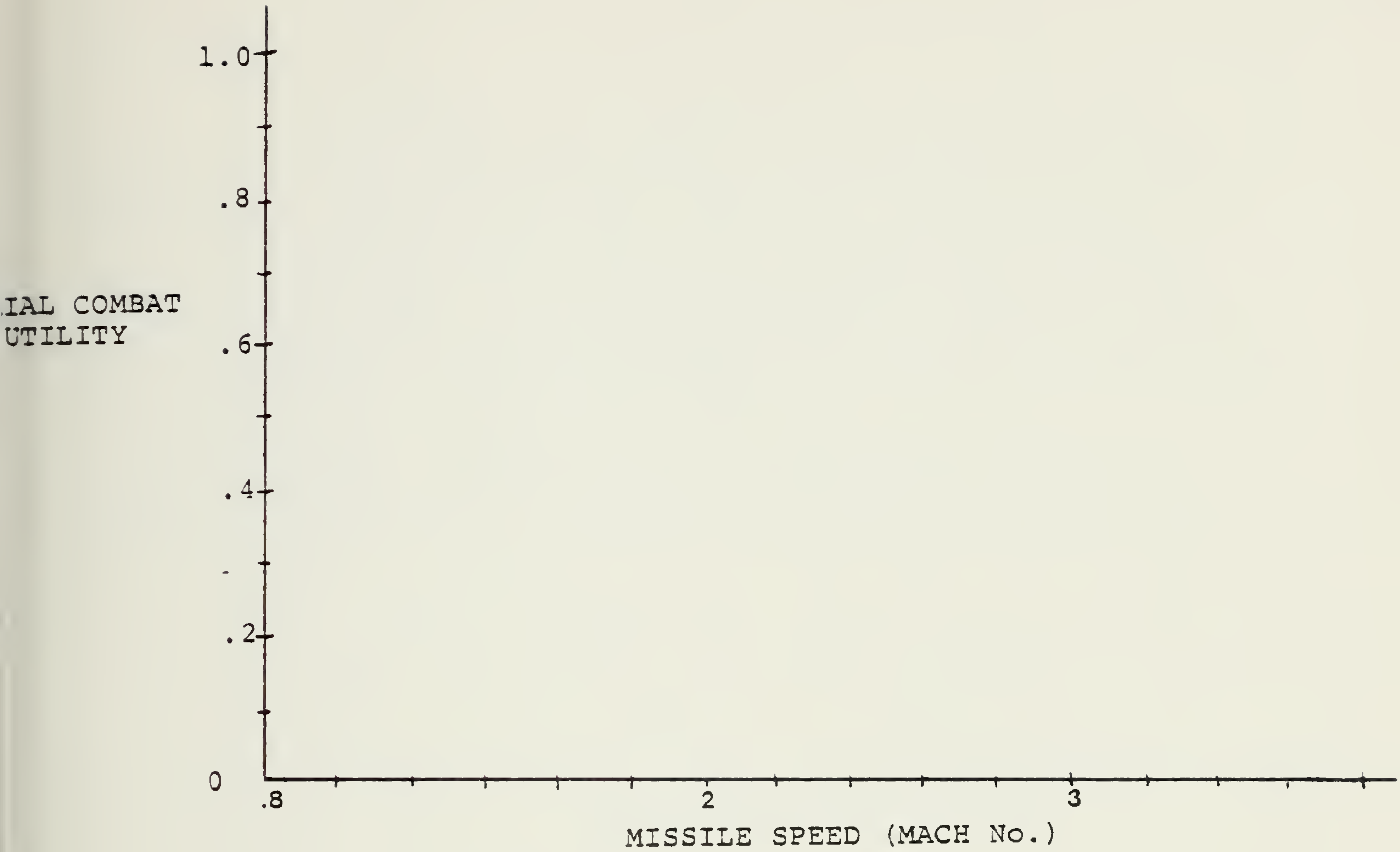
[1]Consider the aircraft in a combat configuration in day, VFR conditions.

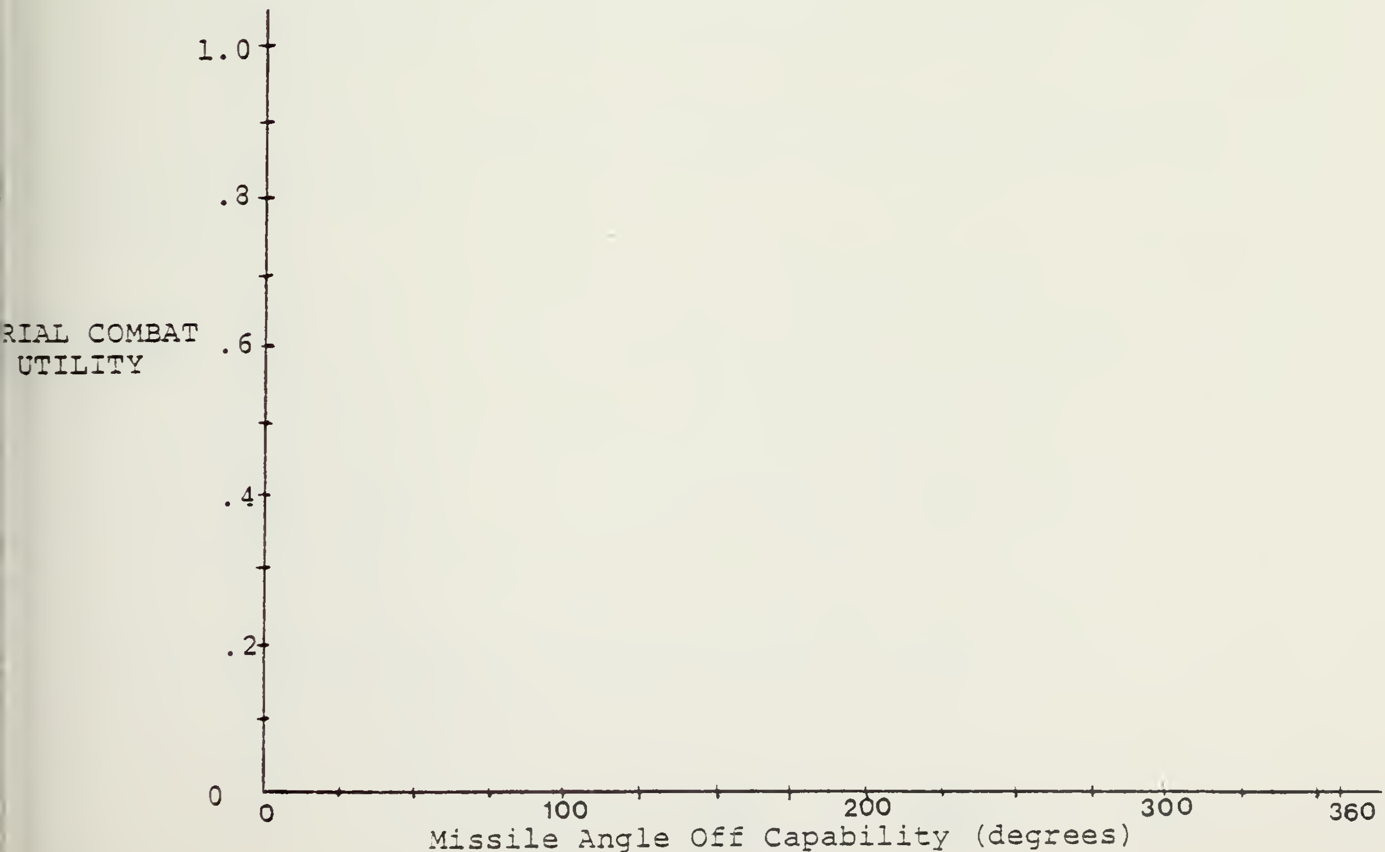

1.0
.8
.6
.4
.2
0
.4
1
2
3
RIAL COMBAT UTILITY
THRUST/WEIGHT

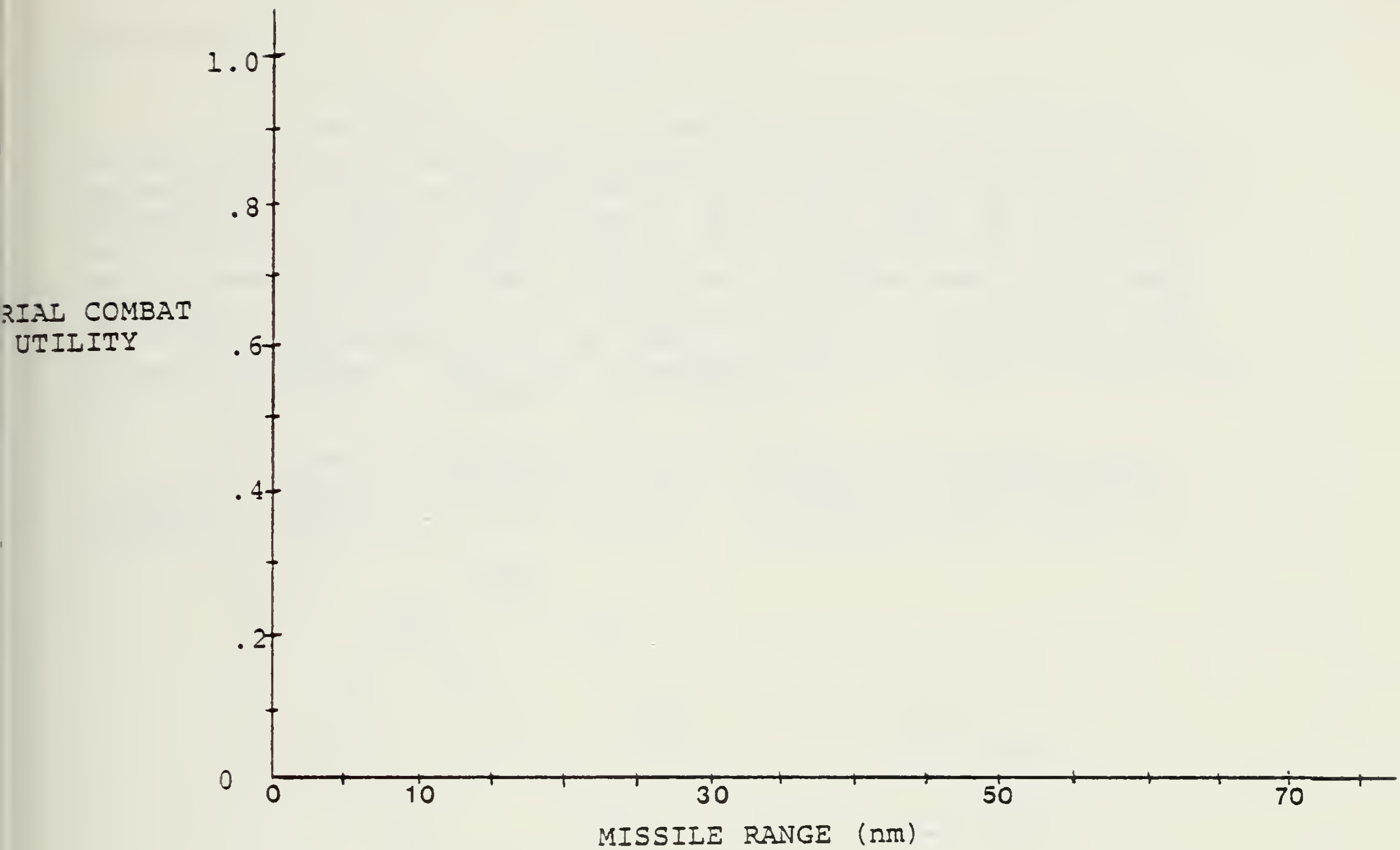

1.0
.8
.6
.4
.2
0
20
60
100
140
RIAL COMBAT UTILITY
WING LOADING (lbs/sq ft)

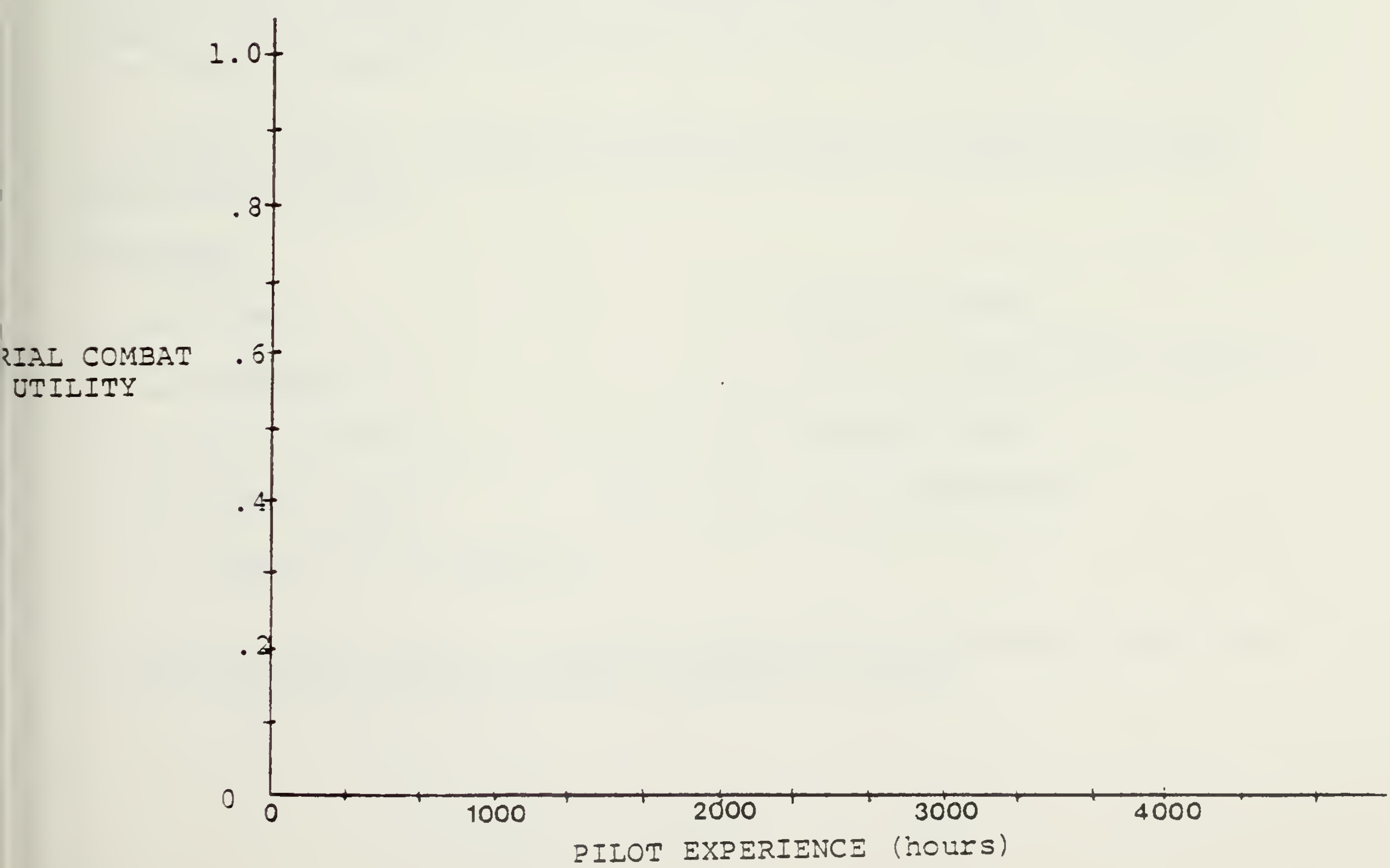

1.0
.8
.6
.4
.2
0
:RIAL COMBAT UTILITY
80
280
480
680
COMBAT RADIUS (nm)


1.0
.8
.6
.4
.2
0
:ERIAL COMBAT UTILITY
0
1
2
3
4
5
NUMBER OF GUN BARRELS


1.0
.8
.6
.4
.2
0
IAL COMBAT
UTILITY
.8
2
3
MISSILE SPEED (MACH No.)


1.0
.8
.6
.4
.2
0
RIAL COMBAT
UTILITY
0
100
200
300
360
Missile Angle Off Capability (degrees)

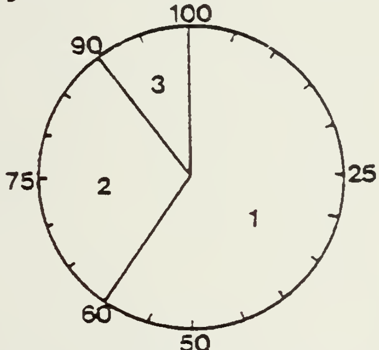

1.0
.8
RIAL COMBAT
UTILITY
.6
.4
.2
0
0
10
30
50
70
MISSILE RANGE (nm)


1.0
.8
RIAL COMBAT
UTILITY
.6
.4
.2
0
0
1000
2000
3000
4000
PILOT EXPERIENCE (hours)

SECTION II

In this section you are to gauge the relative importance of each factor in its contribution to overall air-to-air combat superiority. The manner in which you will indicate your preferences is with the "pie-gram." The "pie-gram" is a pictorial way of indicating the importance of a factor by the thickness or thinness of the slice. This test is often used when there are many factors for it is generally easier to judge the relative importance when you can "see" the size of one slice compared to another. Pies are annotated from 0 - 100 to facilitate the divisions and provide later analysis.

As an example, consider a race car and assume that three factors -- car, driver and track -- completely describe the elements necessary to win a race. A piegram could look like the following:



<u>1</u> Car

<u>2</u> Driver

<u>3</u> Track

This would mean whomever divided the pie feels that the car is the most important factor for winning the race. Its portion takes up 60% of the overall pie and is three times as large as any other "slice."

Our "pie" will have nine (09) slices as there are nine performance factors. Please divide the "pie" in accordance with the above example.

FACTORS

____ Speed

____ Acceleration

____ Wing Loading

____ Combat Radius

____ Number of Gun Barrels

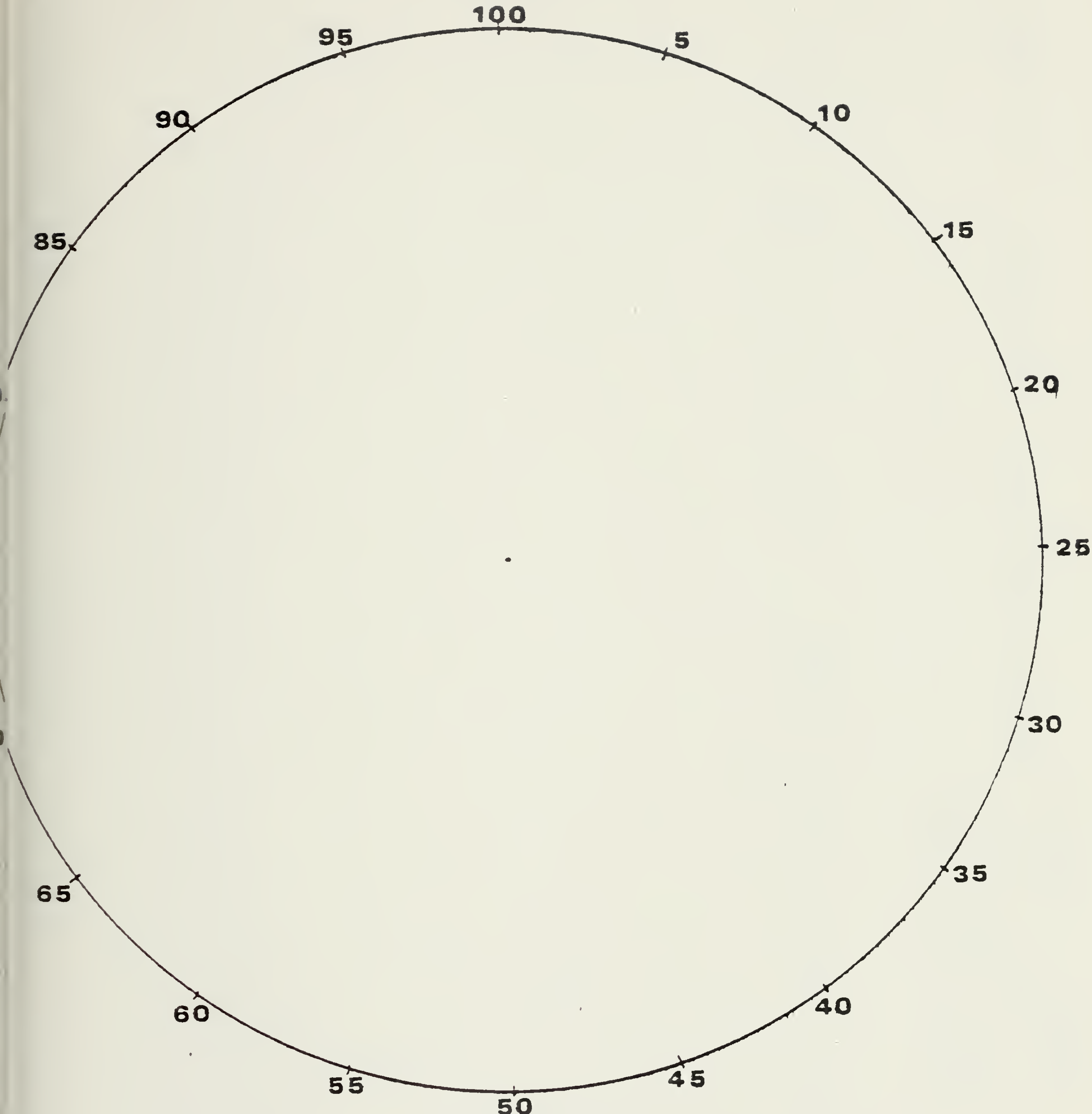
____ Missile Speed

____ Missiles Angle Off Capability

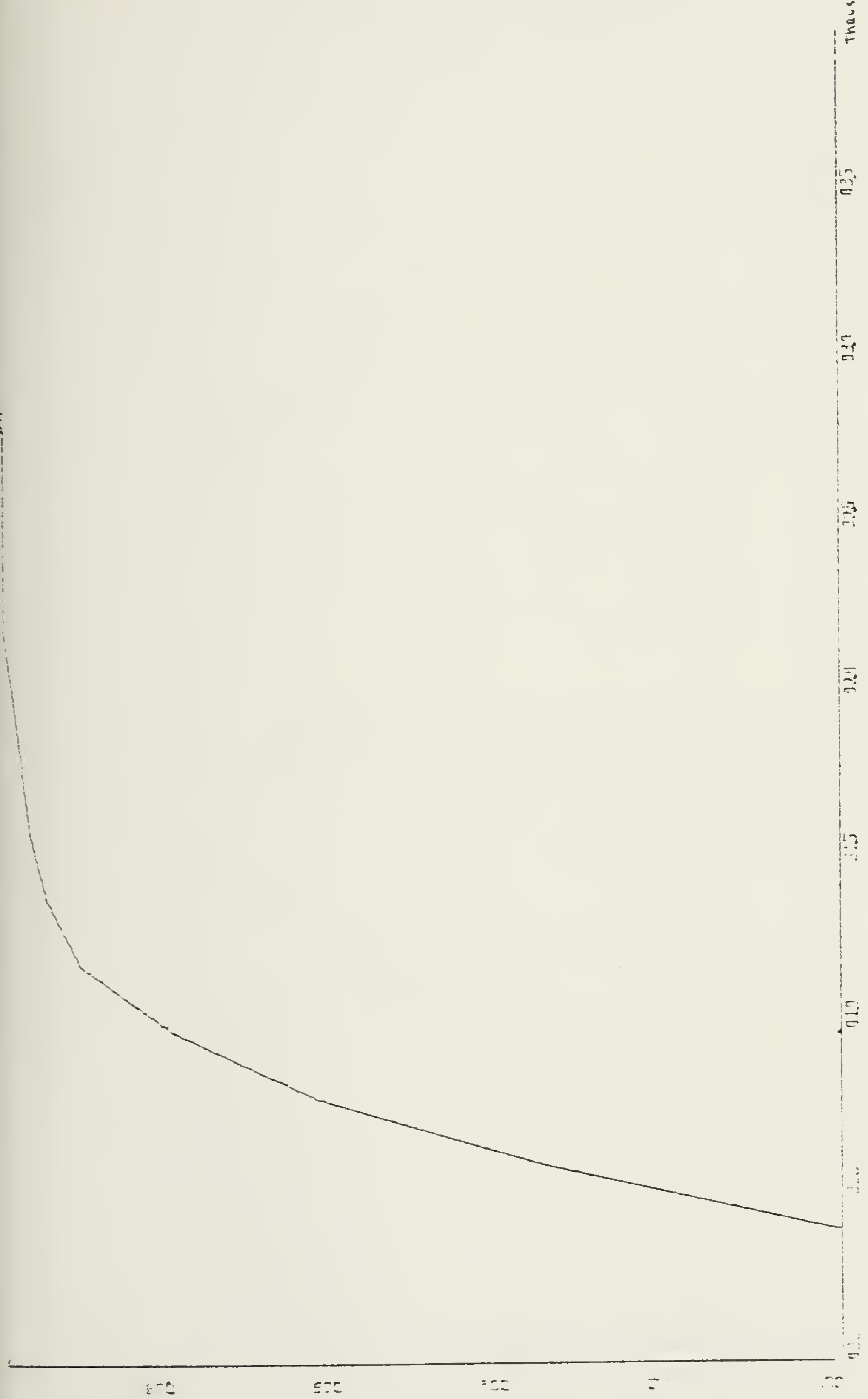
____ Missile Range

____ Pilot Experience

As you divide the "pie" please number each slice and place the corresponding number in the appropriate blank.


100
5
10
15
20
25
30
35
40
45
50
55
60
65
85
90
95

APPENDIX B



X-SCALE 5.00E-01 UNITS INCH.
Y-SCALE 2.00E-01 UNITS INCH.
UTILITY CURVE FOR THRUST-WEIGHT (WEIGHT = 1.00)
SMALL SAMPLE SURVEY

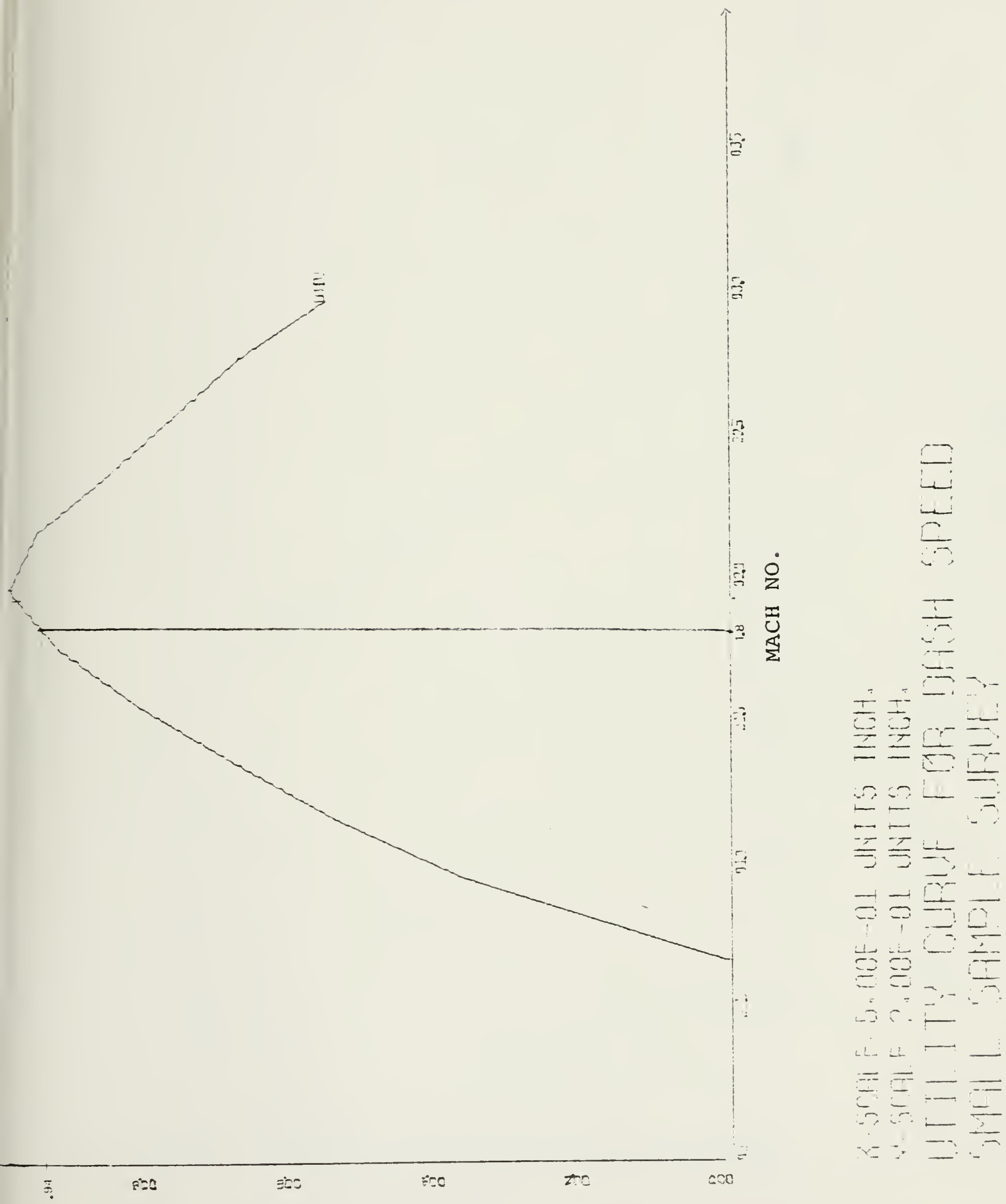
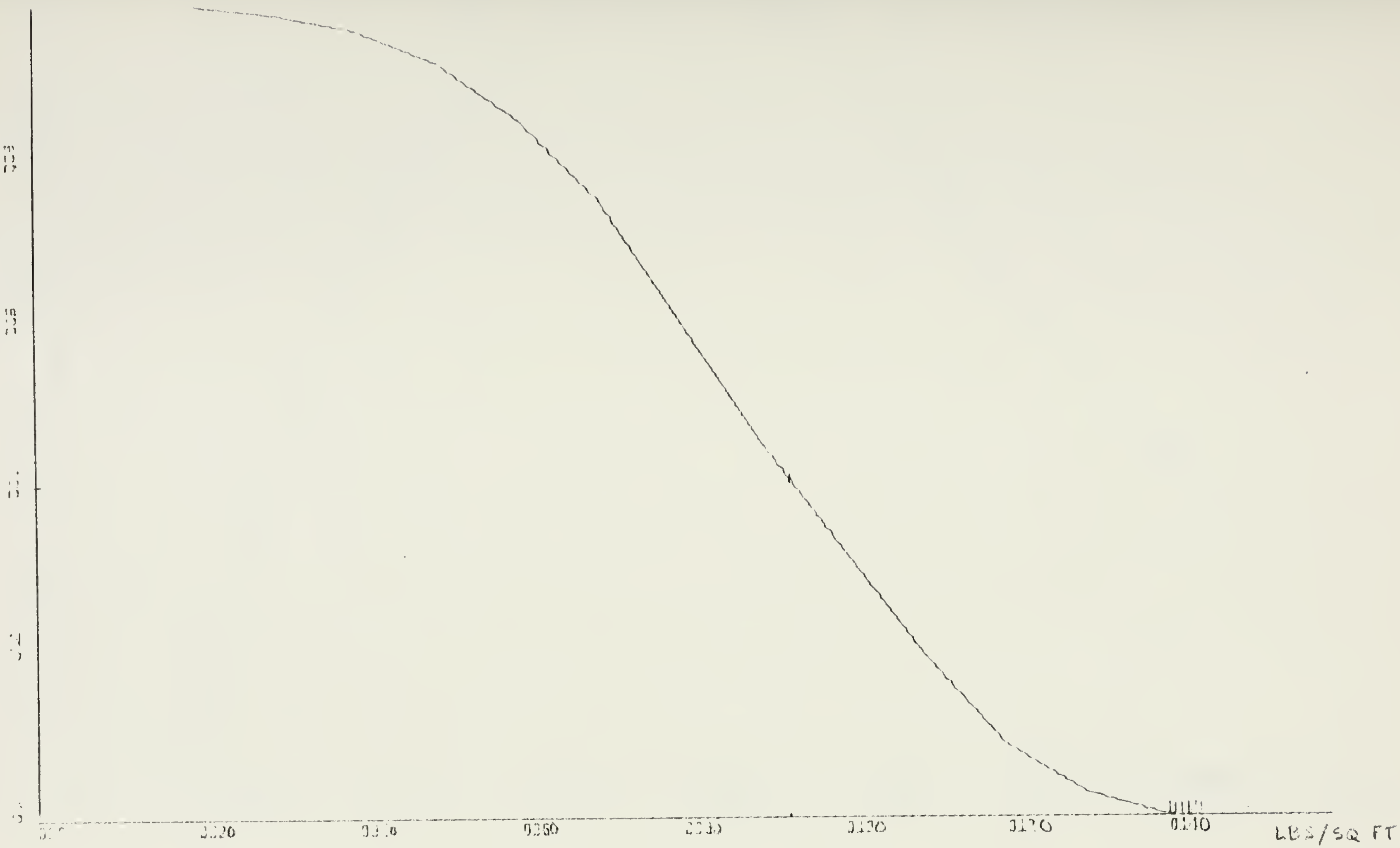
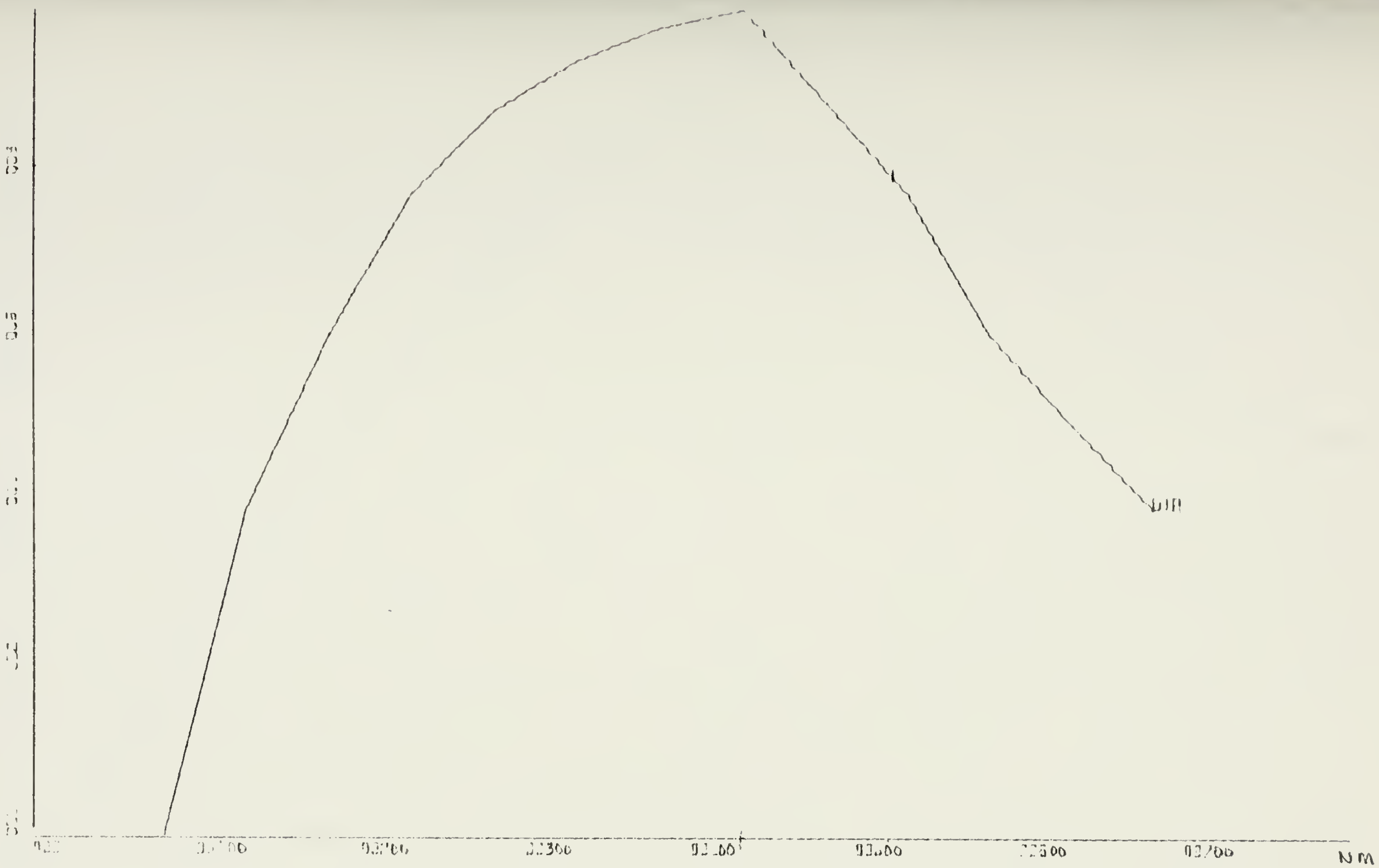

MACH NO.
X-SCALE 5.00E-01 UNITS INCH.
Y-SCALE 2.00E-01 UNITS INCH.
UTILITY CURVE FOR DASH SPEED
SMALL SAMPLE SURVEY

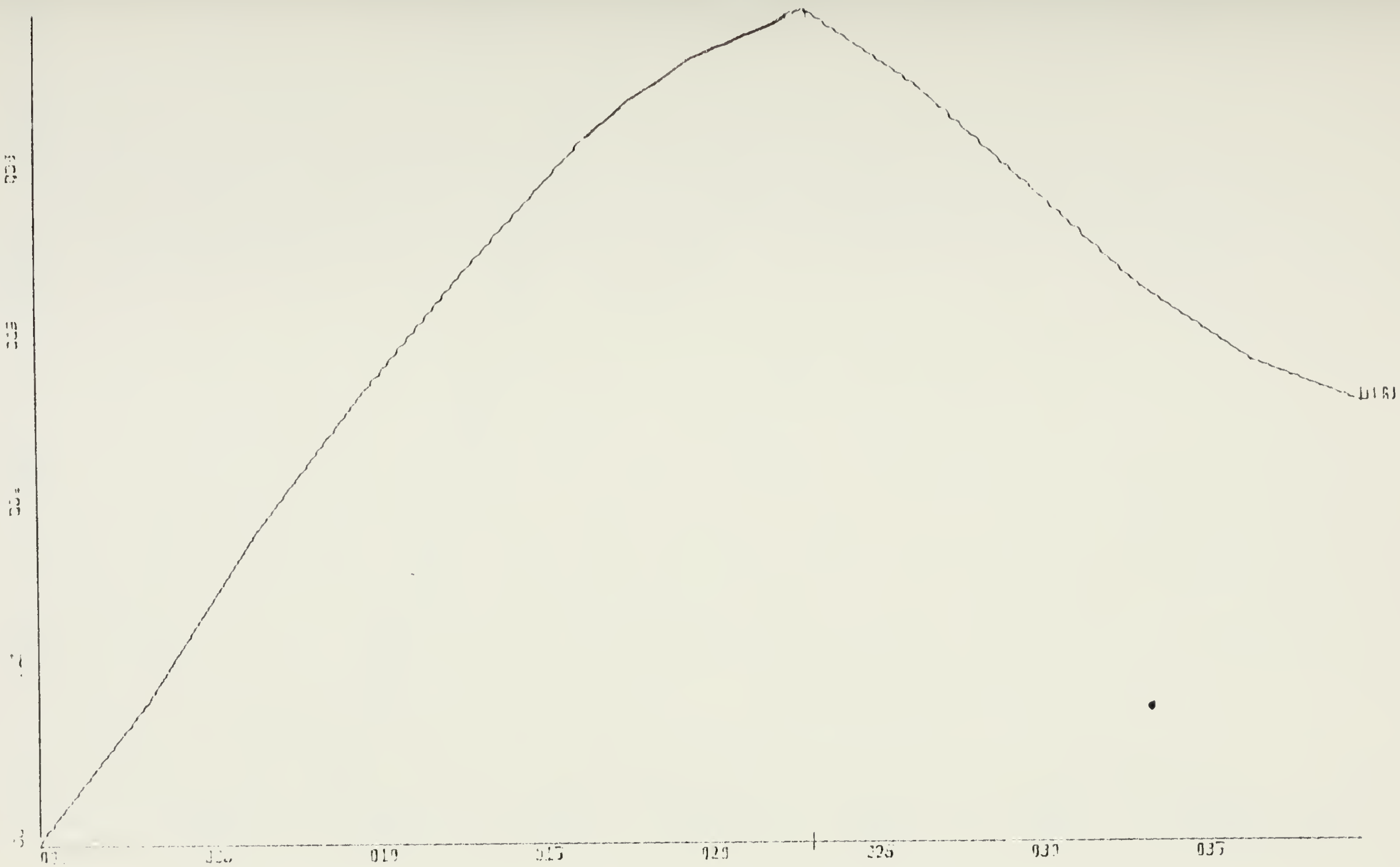
Figure 2



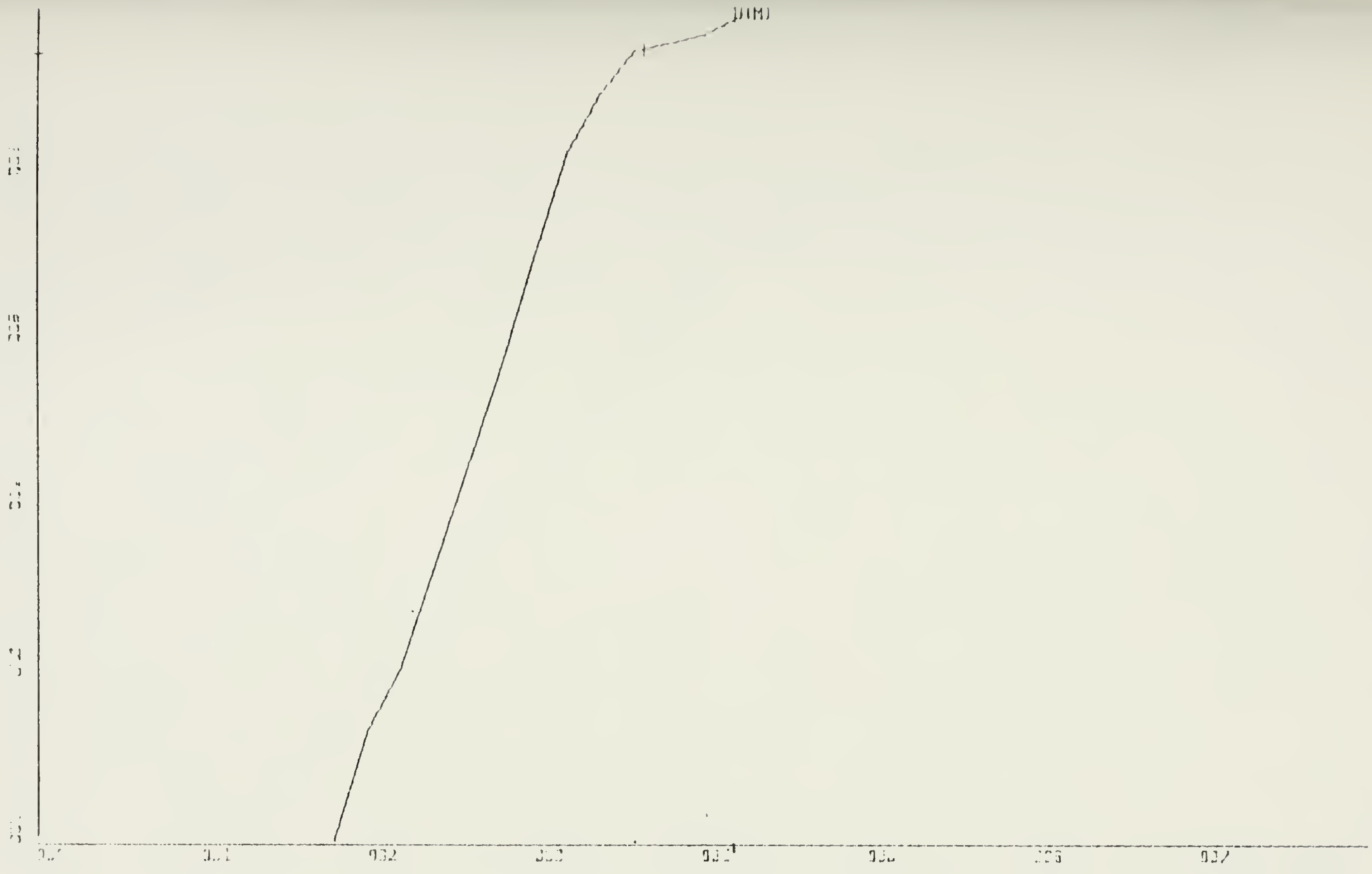
X-SCALE 2.00E+01 UNITS INCH.
Y-SCALE 2.00E-01 UNITS INCH.
UTILITY CURVE FØR WING LØADING
SMALL SAMPLE SURVEY



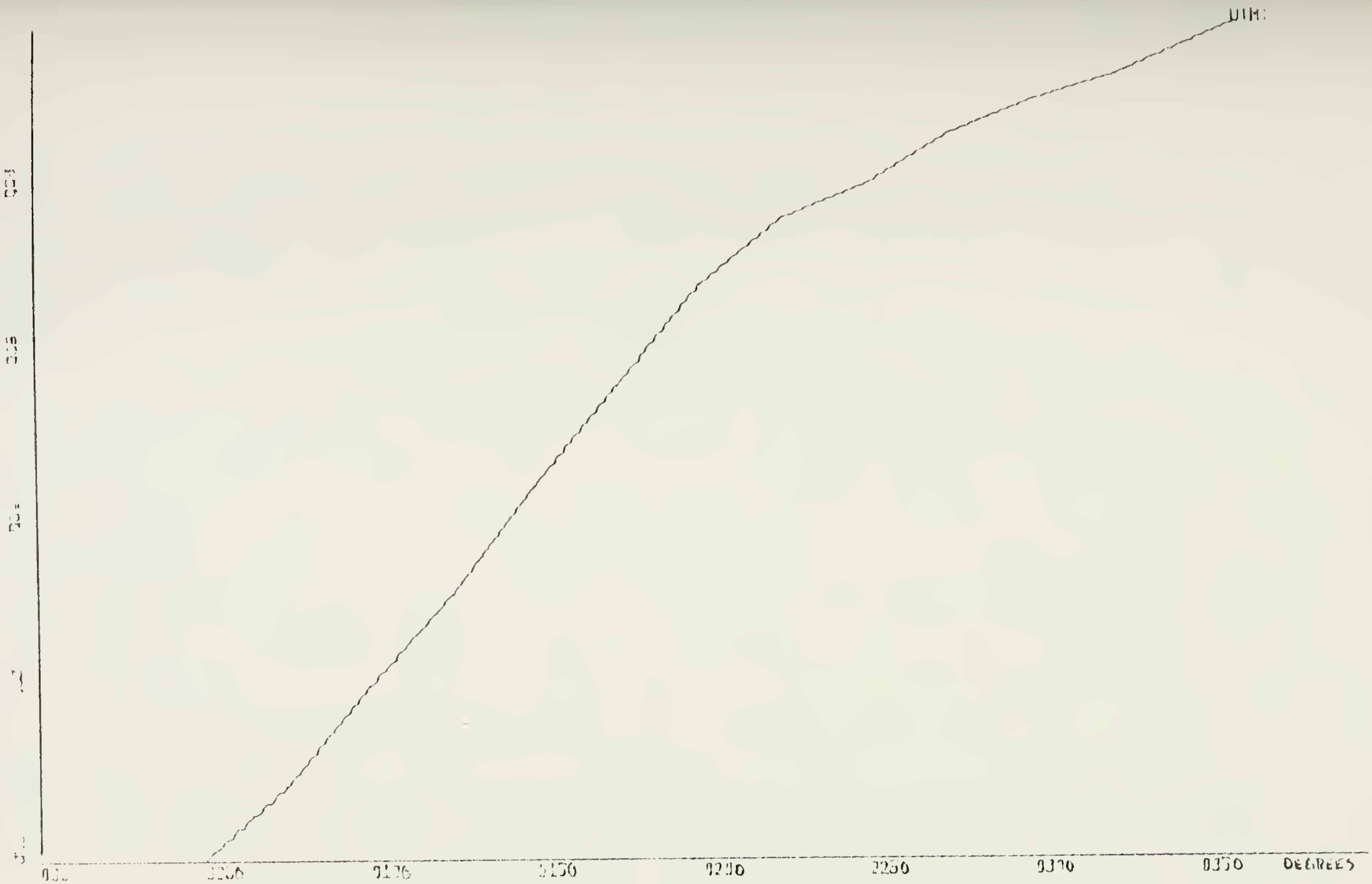
X SCALE 1.00E+02 UNITS INCH.
Y SCALE 2.00E-01 UNITS INCH.
UTILITY CURVE FOR COMBAT RADIUS
SMALL SAMPLE SURVEY



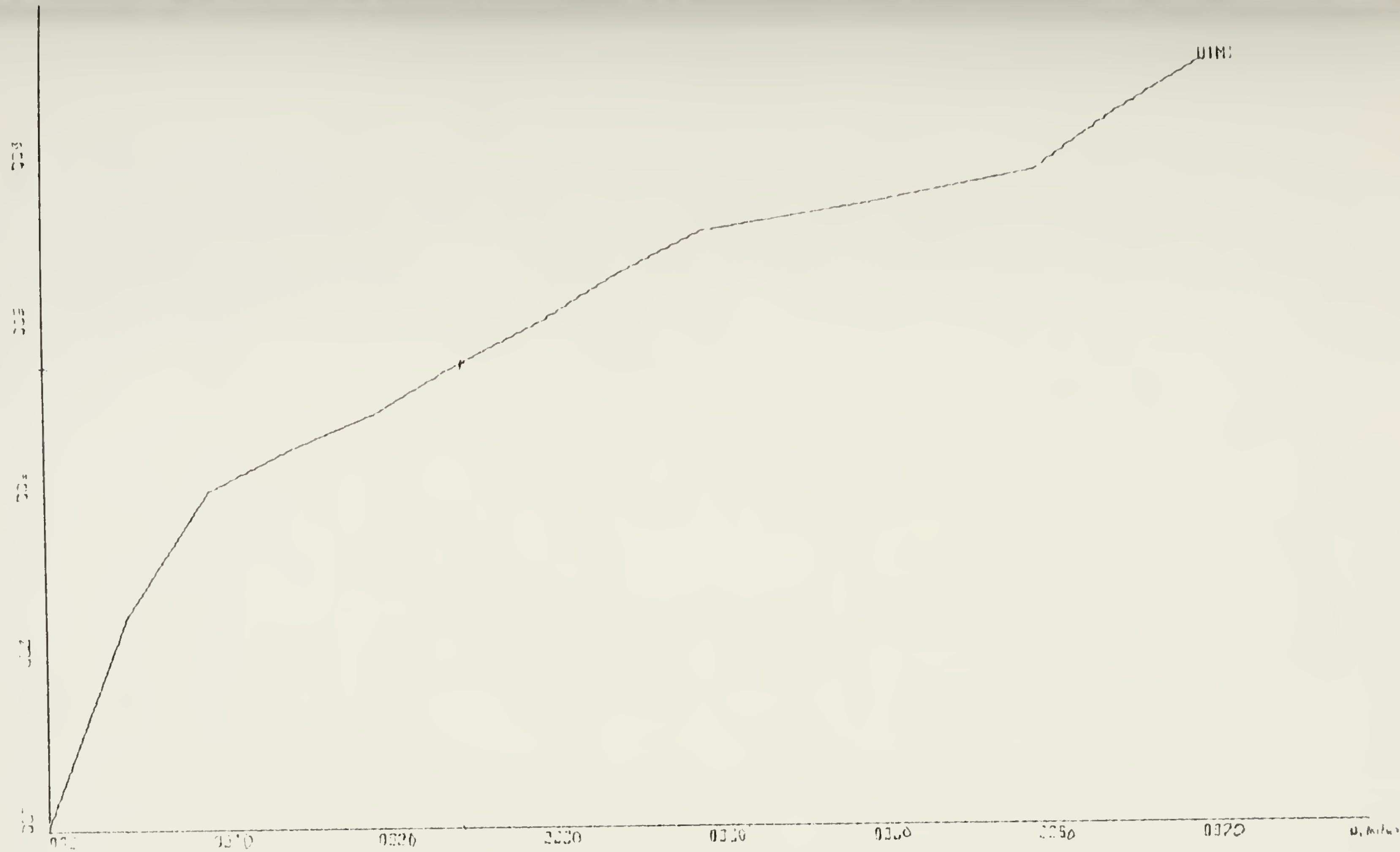
X-SCALE 5.00E-01 UNITS INCH.
Y-SCALE 2.00E-01 UNITS INCH.
UTILITY CURVE FØR NØ. ØF GUN BARRELS
SMALL SAMPLE SURVEY



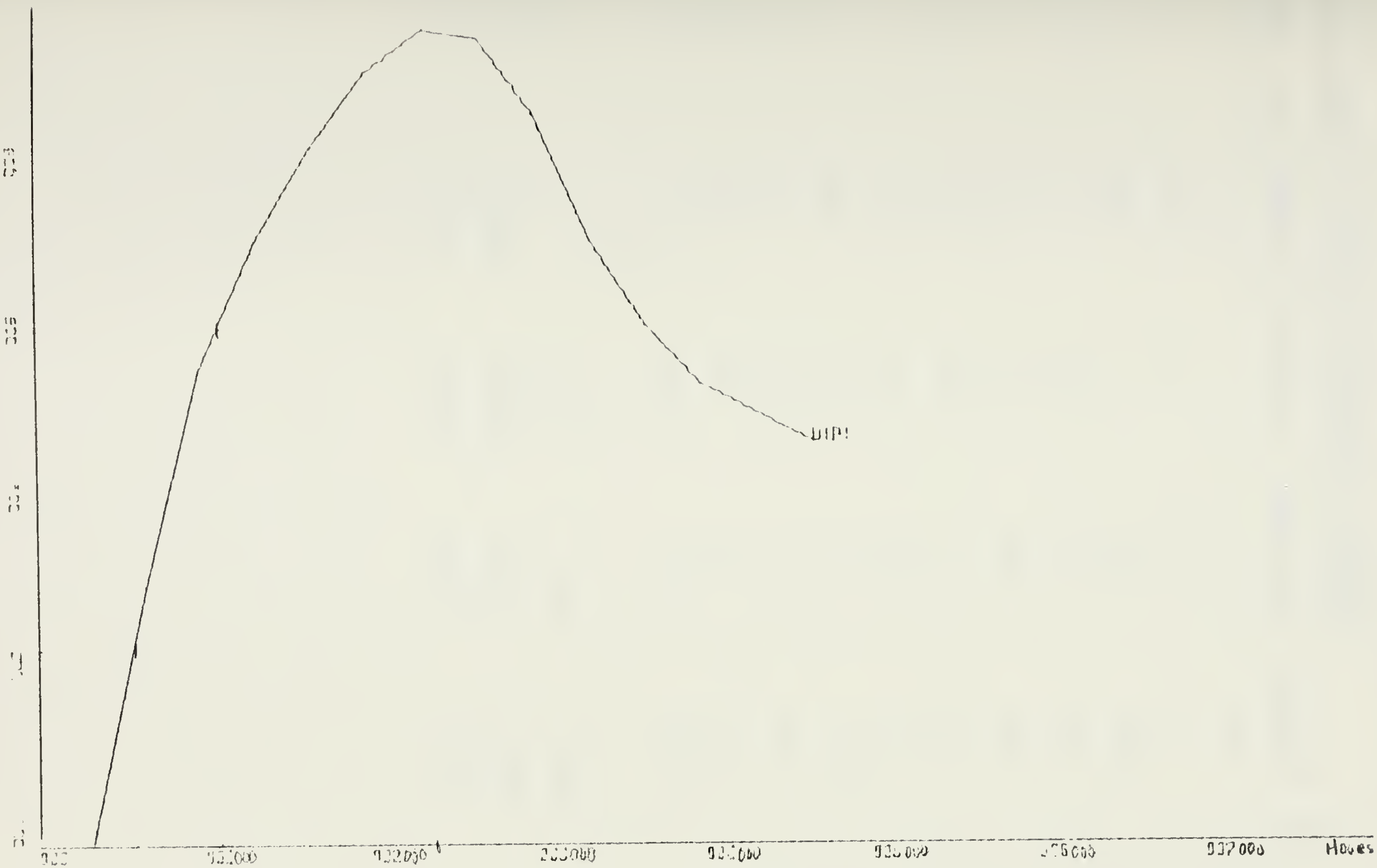
X-SCALE 1.00E+00 UNITS INCH.
Y-SCALE 2.00E-01 UNITS INCH.
UTILITY CURVE FØR MISSILE SPEED
SMALL SAMPLE SURVEY



X-SCALE 5.00E+01 UNITS INCH.
Y-SCALE 2.00E-01 UNITS INCH.
UTILITY CURVE FØR MISSILE ANGLE ØFF CAPABILITY
SMALL SAMPLE SURVEY



X-SCALE 1.00E+01 UNITS INCH.
Y-SCALE 2.00E-01 UNITS INCH.
UTILITY CURVE FØR MISSILE RANGE
SMALL SAMPLE SURVEY



X-SCALE 1.00E+03 UNITS INCH.
Y-SCALE 2.00E-01 UNITS INCH.

UTILITY CURVE FØR PILØT EXPERIENCE
SMALL SAMPLE SURVEY

APPENDIX C

SMALL SAMPLE FACTOR (COMPONENT) WEIGHTS

RESP.	A/C SPEED	A/C ACCEL	WING LOAD	C-RADIUS	NO. OF GB
1	.1	.2	.1	.07	.05
2	.05	.2	.1	.1	.05
3	.025	.1	.15	.025	.05
4	.10	.05	.10	.05	.025
5	.10	.15	.15	.05	.075
6	.05	.25	.20	.10	.05
7	.10	.05	.10	.10	.05
8	.08	.125	.15	.125	.05
9	.30	.015	.25	.09	.0
10	.215	.05	.14	.05	.05
11	.20	.375	.115	.05	.025
$\overline{X}$	.12	.1423	.1414	.0736	.0382
σ^2	.00698	.01163	.0023	.0001	.0002
σ	.0835	.1079	.048	.031	.015

RESP.	MISS. SPD	MISS. ℄-OFF	MISS RANGE	PILOT HOURS
1	.05	.2	.08	.15
2	.05	.1	.05	.30
3	.015	.025	.01	.60
4	.025	.10	.05	.50
5	.05	.10	.075	.25
6	.05	.10	.05	.15
7	.05	.10	.05	.40
8	.04	.08	.05	.30
9	.015	.015	.015	.30
10	.05	.07	.05	.135
11	.025	.025	.05	.135
$\overline{X}$	.0382	.083	.048	.31
σ^2	.0002	.003	.0004	.021
σ	.0150	.052	.021	.146

DISCUSSION

Examination of the data reveals that the factor entitled "C-Radius" (combat radius) possesses the smallest variance and therefore exhibits the least amount of data dispersion about the mean ($\bar{X}$). This infers there was considerable agreement among the respondents concerning the optimum value for combat radius. Thus, the analyst would have the more confidence in this value than in any of the others.

Similarly, the factor labelled "Pilot Hours" has the largest variance among the received responses. This would indicate the most controversial optimum value among the factors.

Perhaps the agreement exhibited for combat radius reflects the fact that this factor was not as important as the others. That is, the respondents collectively felt this was a non-critical factor and a value of "X" was close enough. On the other hand, pilot hours are more personal. A small weighting of this factor would imply a pilot's part is relatively minor/unimportant to the overall mission and vice versa. Therefore, this research assumes the answers will reflect the mental homogeneity of the respondents more than objective observation of this factor's overall contribution.

APPENDIX D

CHARACTERISTICS OF FIGHTER AIRCRAFT

The ever increasing transfer of fighter aircraft to the lesser developed countries generates a mounting concern among many military planners. The current, quantitative techniques to evaluate the military worth of such transfers often revolve around the budgetary or inventory type models. This research effort intends to expand on the inventory method by including such factors as the maintenance capability of the country, pilot experience and the previously untested concept of comparing their fighters against the "ideal" fighter, a (theoretical) plane designed from the experience of many pilots in the various TACAIR communities that, hopefully, is captured by this questionnaire.

Thus, to complete this survey, you need not remember specific technical features of any particular aircraft. Just respond using your intuition and experience, and remember the survey is concerned with <u>air</u>-<u>to</u>-<u>air</u> performance factors. Please work independently as cross comparisons with other participants will invalidate the subsequent mathematical tests.

SECTION I | Total Pilot Hours ________

Aircraft Flown ________________ | Branch of Service ________

Below are a number of factors describing aircraft performance. Previous research has identified these characteristics as a reasonably complete way of classifying aircraft. Your task for this section is to estimate a lower and upper limit for each factor listed. The lower limit represents the value (or amount) you feel is the minimum a fighter aircraft could have and still be effective in aerial combat. The upper limit is a technologically feasible point that you feel yields a clearcut combat superiority, i.e., any further improvements would be of marginal value.

For example, if you were considering the purchase of a race car, you might choose a lower limit of 140 mph and an upper limit of 250 mph. By this choice of limits, you feel that if a car (when considering the factor of speed alone) could not do <u>at least</u> 140 mph, it would not be in the class of race cars and you would not buy it. Similarly, the upper limit of 250 mph means you feel this car will easily outrun its competition and further speed increases would be of marginal value.

When considering these factors, try to consider each one individually, ignoring its effect or relation to any other factor. Admittedly, in the real world this is not possible, for an increase or decrease in one factor (say manueverability) will have some very direct effect on other factors (i.e., top speed, wing loading, etc.). But for now, as you mark the factors below, assume we have some magic process that can alter one factor at no consequence to another.

PLATFORM FACTORS	LOWER LIMIT	UPPER LIMIT
a. Dash Speed (MACH No.) combat configuration, minimum combat package*	________	________
b. Acceleration (thrust/weight ratio) minimum combat package*	________	________
c. Wing Loading (lbs/square foot)	________	________
d. Combat Radius (nautical miles)	________	________

* Since the amount of fuel will affect your answer, this requirement is an attempt to standardize the replies. Here, the minimum combat package means the minimum fuel state at which you would consider a combat engagement with a return to home base.

SECTION I (con't)

	LOWER LIMIT	UPPER LIMIT
WEAPON FACTORS		
a. Number of Gun Barrels	________	________
b. Missiles (do not categorize mentally as IR, Radar or Laser. What feasible end results would you like to see)		
(1) Speed (MACH No.)	________	________
(2) Angle Off (degrees)	________	________
(3) Range (nautical miles)	________	________
EXPERIENCE FACTORS		
Total (actual) Pilot Hours	________	________

Lower limit - minimum number of hours you would want your wingman to have

Upper limit - amount of (attainable) hours you wish your wingman had

SECTION II

For this section, assume our magic aircraft engineer has completely designed an aircraft except for one factor. For this factor he can choose a "risky" design or a "safe" design. If he picks the "risky" design, there is a 50% chance the factor will have the lower limit you specified (in Section I) and a 50% chance it will have the upper limit.

On the other hand, if the engineer chooses the "safe" design you are 100% certain the factor will have some arbitrary "safe value" (this value would be some number between the upper and lower limit). Your task is to estimate how low this "safe value" would have to be before you would consider giving it up and accepting the results of the "risky" design.

To further illustrate, consider the race car example of Section I and the factor of speed. The limits were given as 140 and 250 mph, therefore the alternatives would be as follows:

Risky Design - 50% chance car will have a speed of 140 mph
50% chance car will have a speed of 250 mph

Safe Design - 100% chance car will have the "safe value"

If the designer told you the "safe value" was 249 mph and asked you to recommend a design, you probably would choose the safe design. Not much point in giving up a sure 249 mph for what you could get from the risky design -- a 50% chance the speed would be 250 mph (1 mph faster) and a 50% chance the speed would be 140 mph (109 mph slower!).

On the other hand, if the designer told you the "safe value" was 143 mph and asked for your recommendation, you would probably tell him to go ahead with the "risky" design. Not much to lose (going from 143 mph down to 140 mph) and a lot to gain (going from 143 mph up to 250 mph). So in this case you would probably disregard the sure 143 safe value and gamble on the "risky" design.

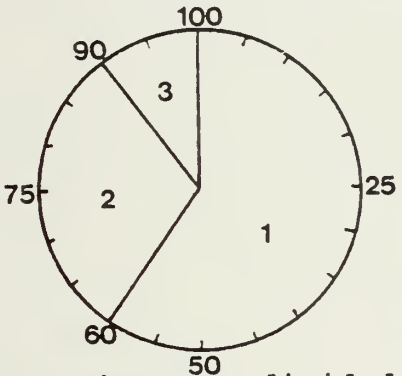
Somewhere between the upper and lower limits you selected, there is a "safe value" that makeschoosing the "risky" design just as attractive as choosing the "safe" design. Thus, for each factor listed below, please indicate the cutoff "safe value."

	SAFE VALUE
PLATFORM FACTORS	
a. Dash Speed (MACH No.) combat configuration, minimum combat package	________
b. Acceleration (thrust/weight ratio) minimum combat package	________
c. Wing Loading (lbs/square foot)	________
d. Combat Endurance (nautical miles)	________
WEAPON FACTORS	
a. Number of Gun Barrels	________
b. Missiles (do not categorize mentally as IR, Radar or Laser. What feasible end results would you like to see)	
(1) Speed (MACH No.)	________
(2) Angle Off (degrees)	________
(3) Range (nautical miles)	________
EXPERIENCE FACTORS	
Total (actual) Pilot Hours	________

SECTION III

In this section you are to gauge the relative importance of each factor in its contribution to overall air-to-air combat superiority. The manner in which you will indicate your preferences is with the "pie-gram." The "pie-gram" is a pictorial way of indicating the importance of a factor by the thickness or thinness of the slice. This test is often used when there are many factors for it is generally easier to judge the relative importance when you can "see" the size of one slice compared to another. Pies are annotated from 0 - 100 to facilitate the divisions and provide later analysis.

As an example, consider the race car mentioned in Section I and assume that three factors -- car, driver and track -- completely describe the elements necessary to win a race. A pie-gram could look like the following:



1 Car

2 Driver

3 Track

This would mean whomever divided the pie feels that the car is the most important factor for winning the race. Its portion takes up 60% of the overall pie and is three times as large as any other "slice."

Our "pie" will have nine (09) slices as there are nine performance factors. Please divide the "pie" in accordance with the above example.

FACTORS

____ Speed

____ Acceleration

____ Wing Loading

____ Combat Radius

____ Number of Gun Barrels

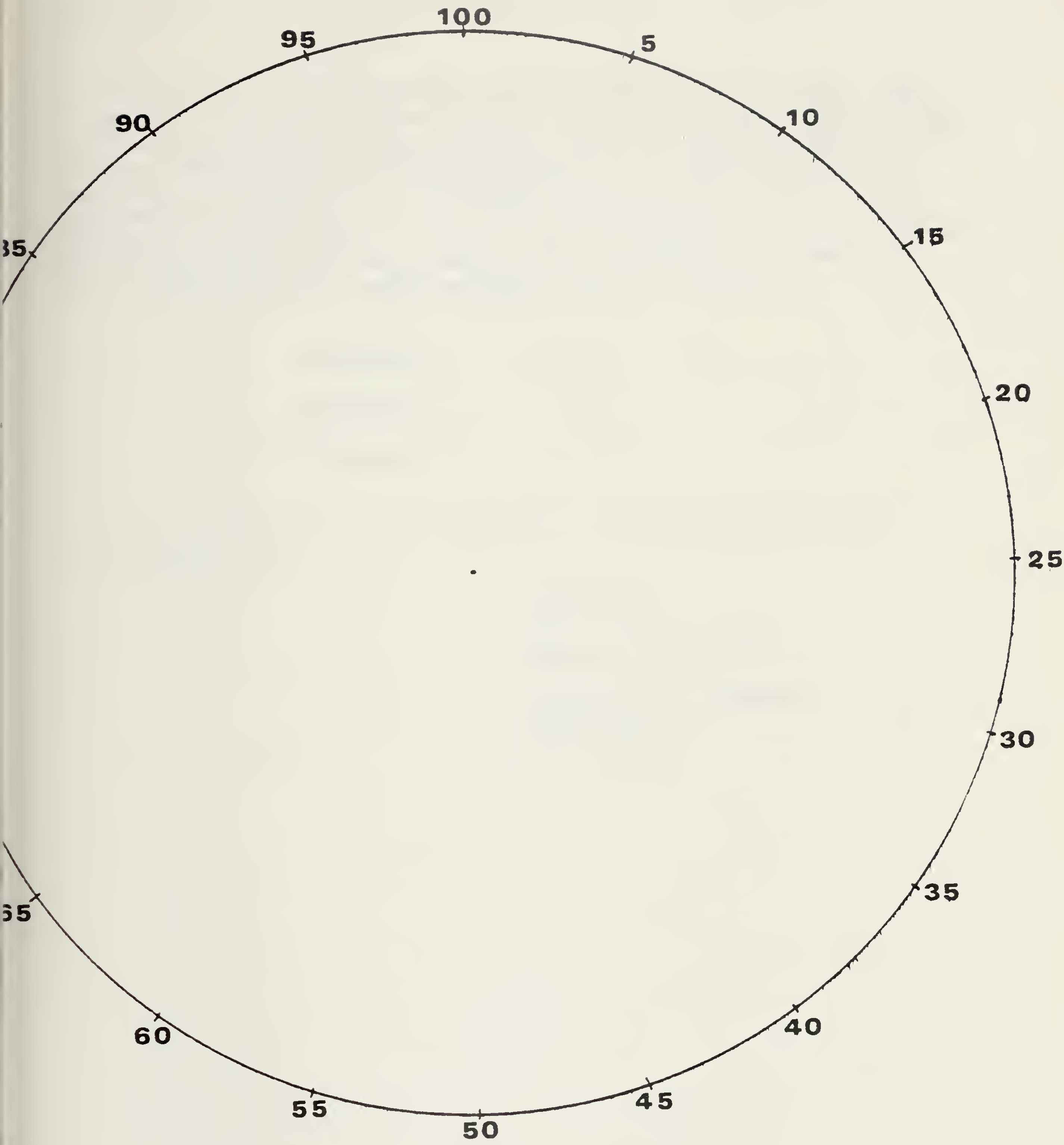
____ Missile Speed

____ Missiles Angle Off Capability

____ Missile Range

____ Pilct Experience

As you divide the "pie" please number each slice and place the corresponding number in the appropriate blank.


100
5
10
15
20
25
30
35
40
45
50
55
60
65
85
90
95

SECTION IV

Composing a questionnaire is an inherently difficult task as this device only allows one-way communication. This problem inevitably leaves the investigator with a nagging doubt concerning the participants' interpretations of the posed questions. Therefore, I would like to conclude this survey with a rather unscientific procedure to determine the extent of your interpretation difficulties, if any. On a scale of 1 - 100, please rate the first three sections on the confidence you have in your understanding of the question (100 is the best).

SECTION I _____

SECTION II _____

SECTION III _____

I thank you for your cooperation and participation in this survey.

Sincerely,

Patrick M. O'Connell

PATRICK M. O'CONNELL
Lieutenant
U. S. Navy

APPENDIX E

KEY TO NUMERICAL CODES

SERVICE

1 = Air Force	3 = Marine Corps	5 = Unknown
2 = Navy	4 = Civilian	

COMMUNITY

1 = VA	5 = VF/VR
2 = VF	6 = VF/Bomber
3 = VA/VF	7 = VF/VC
4 = VF/Commerical	8 = Bomber

MISSING VALUES

Wing Loading

1.0 = no response for lower limit

2.0 = no response for upper limit

3.0 = no response for 50th utile

Combat Radius

9997.0 = no response for lower limit

9998.0 = no response for upper limit

9999.0 = no response for 50th utile

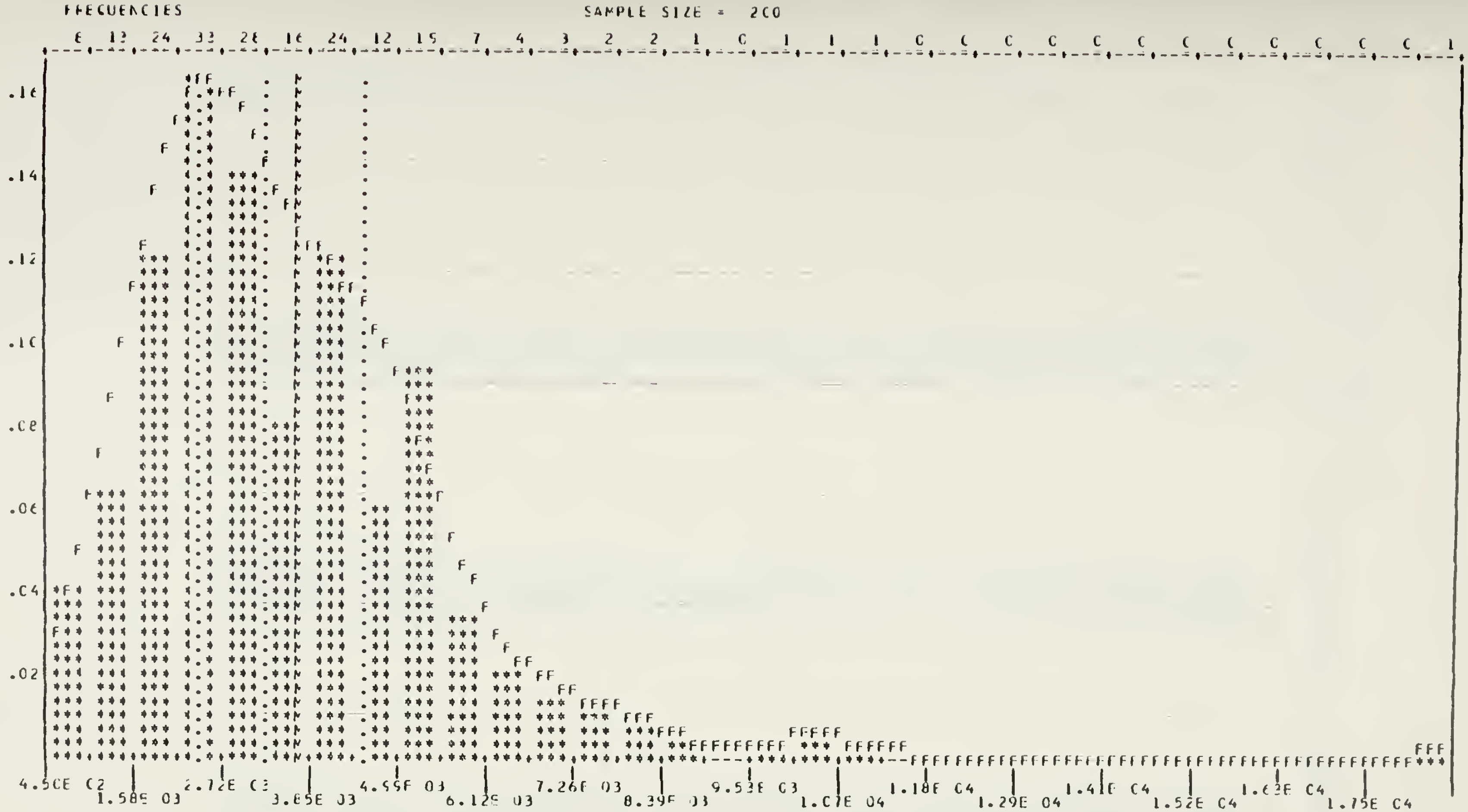
Note: There are a total of 200 respondants. Each one has a number (1,2,3, ..., 200) that is consistent throughout the data presentation. Respondant 1 for dash speed is also Respondant 1 for acceleration, etc.

RESPONDANT	SERVICE	PILOT HOURS	COMMUNITY
1	1	2800	2
2	2	4300	1
3	1	2100	2
4	1	18600	4
5	1	5000	2
6	1	5500	2
7	2	1200	1
8	1	1300	2
9	1	3000	2
10	1	4500	2
11	2	1600	2
12	1	4400	2
13	1	2800	2
14	1	10350	4
15	1	3150	2
16	1	4900	2
17	1	2400	2
18	1	5600	2
19	1	1500	2
20	1	2700	2
21	1	2400	2
22	1	6230	2
23	1	2640	2
24	4	2600	3
25	1	3000	2
26	1	6889	5
27	1	3700	3
28	1	1250	2
29	1	4000	2
30	2	5600	2
31	1	1850	2
32	2	1800	2
33	1	2000	2
34	1	2500	2
35	1	4600	4
36	1	2600	2
37	3	850	2
38	1	5000	2
39	1	7500	2
40	1	2200	2
41	2	1000	1
42	1	5000	2
43	2	4000	3
44	1	2500	3
45	1	1370	2
46	1	6000	2
47	1	7800	2
48	2	2600	2
49	1	2250	1
50	2	2100	3

RESPONDANT	SERVICE	PILOT HOURS	COMMUNITY
51	1	2000	2
52	1	2500	2
53	1	5200	2
54	2	1000	2
55	1	3600	1
56	1	1650	2
57	1	4500	2
58	1	2500	2
59	2	1950	2
60	1	11000	4
61	2	3800	1
62	2	4500	3
63	1	2400	2
64	2	1000	2
65	1	7000	2
66	1	4650	2
67	1	3200	3
68	1	3200	2
69	1	3000	2
70	5	8000	2
71	1	450	2
72	1	4000	2
73	1	5000	2
74	1	2500	2
75	5	2500	2
76	1	2000	2
77	1	2100	2
78	1	3000	2
79	2	2300	2
80	1	5200	2
81	1	4000	3
82	1	3200	6
83	1	4800	2
84	1	5000	3
85	2	2950	2
86	1	1580	2
87	1	3000	3
88	1	3200	3
89	1	4510	2
90	1	4000	2
91	1	3000	2
92	1	6500	2
93	1	5000	2
94	3	4400	2
95	1	2900	2
96	1	3000	2
97	1	5215	2
98	1	1000	7
99	1	3700	2
100	1	3000	2

RESPONDANT	SERVICE	PILOT HOURS	COMMUNITY
101	1	5000	2
102	2	1700	1
103	1	1600	2
104	1	10000	2
105	1	8500	7
106	1	2300	2
107	1	3000	2
108	1	2350	2
109	1	1500	2
110	2	4400	1
111	1	2200	2
112	1	1700	2
113	2	2200	1
114	1	5000	3
115	2	5400	2
116	1	1500	2
117	1	2300	2
118	1	4800	2
119	1	2500	2
120	1	4000	2
121	1	1700	2
122	1	3800	2
123	1	4642	2
124	1	3000	2
125	1	4000	2
126	1	2300	2
127	1	2300	2
128	1	5800	2
129	1	4500	2
130	1	2000	2
131	1	3568	2
132	2	1200	2
133	1	5100	2
134	1	3500	2
135	1	2000	2
136	1	5000	2
137	2	3900	3
138	1	2700	2
139	1	1850	3
140	1	3600	2
141	1	2500	2
142	1	6600	2
143	2	1500	3
144	1	4400	2
145	1	5200	2
146	1	3700	3
147	1	2000	2
148	1	1500	3
149	2	2600	3
150	1	3000	2

RESPONDANT	SERVICE	PILOT_HOURS	COMMUNITY
151	2	2200	1
152	1	3250	3
153	1	800	6
154	1	2660	2
155	2	3000	2
156	1	1400	2
157	1	3200	2
158	1	4100	2
159	1	4000	2
160	1	4000	2
161	1	1000	2
162	2	4400	1
163	1	4400	2
164	1	1986	2
165	1	3000	1
166	1	5200	3
167	1	6000	1
168	1	4000	3
169	1	4200	2
170	1	3000	2
171	1	3800	2
172	2	6000	2
173	2	3300	2
174	2	3400	1
175	1	2030	3
176	2	5300	2
177	1	2500	2
178	2	4300	3
179	1	2700	2
180	1	2300	2
181	3	6500	2
182	1	4250	2
183	1	5600	2
184	1	3200	2
185	1	1500	2
186	1	6700	2
187	1	3900	2
188	1	3700	2
189	1	3300	2
190	2	1900	1
191	2	3500	1
192	1	2695	2
193	1	2700	2
194	1	3900	2
195	1	1800	2
196	1	3550	2
197	1	3200	2
198	1	5200	2
199	2	4780	1
200	1	1900	3



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION		
MEAN	3.616575E 03	VARIANCE	4.383544E 06	M3	2.331778E 10	MINIMUM		4.500000E 02
MEDIAN	3.200000E 03	STD DEV	2.093787E 03	M4	3.095371E 14	.10 QUANTILE		1.500000E 03
TRIMEAN	3.295000E 03	COEF VAR	5.785580E-01	SKEWNESS	2.546665E 00	.25 QUANTILE	(HINGE)	2.275000E 03
MIDMEAN	3.300430E 03	MEAN DEV	1.440865E 03	KURTOSIS	1.312143E 01	.50 QUANTILE	(MEDIAN)	3.200000E 03
MIDRANGE	9.525000E 03	RANGE	1.815000E 04	BETA1	2.302828E 10	.75 QUANTILE	(HINGE)	4.505000E 03
GEOM MEAN	3.142448E 03	MIDSPREAD	2.230000E 03	BETA2	3.042131E 14	.90 QUANTILE		5.600000E 03
HARM MEAN	2.693554E 03					MAXIMUM		1.860000E 04

TOTAL PILOT HOURS OF RESPONDENT

FACTOR: DASH SPEED(MACH NO.)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
1	0.90	1.75	2.50	0.125
2	1.60	2.00	2.30	0.080
3	1.50	1.80	2.50	0.075
4	0.65	1.50	2.00	0.150
5	1.50	2.10	2.50	0.100
6	1.40	1.60	2.20	0.050
7	1.20	1.50	2.00	0.100
8	0.99	1.20	1.70	0.050
9	1.11	1.70	2.50	0.100
10	1.61	2.00	2.40	0.150
11	1.20	1.50	2.20	0.130
12	0.95	2.00	3.00	0.150
13	1.10	1.20	1.50	0.100
14	2.00	2.20	3.50	0.500
15	0.90	1.50	2.20	0.100
16	1.20	1.40	3.50	0.100
17	2.00	2.20	3.50	0.100
18	0.90	1.75	1.90	0.150
19	1.50	2.20	2.50	0.050
20	1.40	1.75	2.50	0.100
21	1.40	2.20	2.40	0.075
22	0.90	1.80	2.50	0.100
23	0.60	1.00	2.50	0.100
24	1.90	2.20	2.50	0.100
25	1.60	2.00	2.50	0.050
26	1.00	1.20	2.50	0.100
27	0.75	1.80	2.50	0.200
28	1.40	1.50	2.00	0.070
29	1.20	1.30	1.60	0.050
30	1.60	1.70	1.80	0.060
31	1.50	2.00	2.50	0.065
32	1.20	1.75	2.50	0.200
33	1.50	2.00	3.00	0.125
34	1.30	1.50	2.00	0.075
35	1.60	1.80	2.50	0.040
36	1.60	2.00	3.00	0.100
37	1.40	1.60	2.40	0.040
38	0.66	2.50	3.00	0.150
39	1.20	1.40	2.40	0.065
40	1.40	2.20	3.00	0.100
41	0.50	0.85	2.50	0.083
42	1.50	2.50	2.30	0.150
43	1.20	1.60	2.00	0.080
44	1.30	1.80	3.00	0.050
45	1.60	1.80	2.00	0.130
46	0.80	1.10	1.50	0.080
47	2.00	2.20	2.50	0.100
48	2.60	2.70	2.80	0.060
49	1.50	1.70	2.30	0.100
50	0.95	1.30	1.50	0.045

FACTOR: DASH SPEED(MACH NO.)

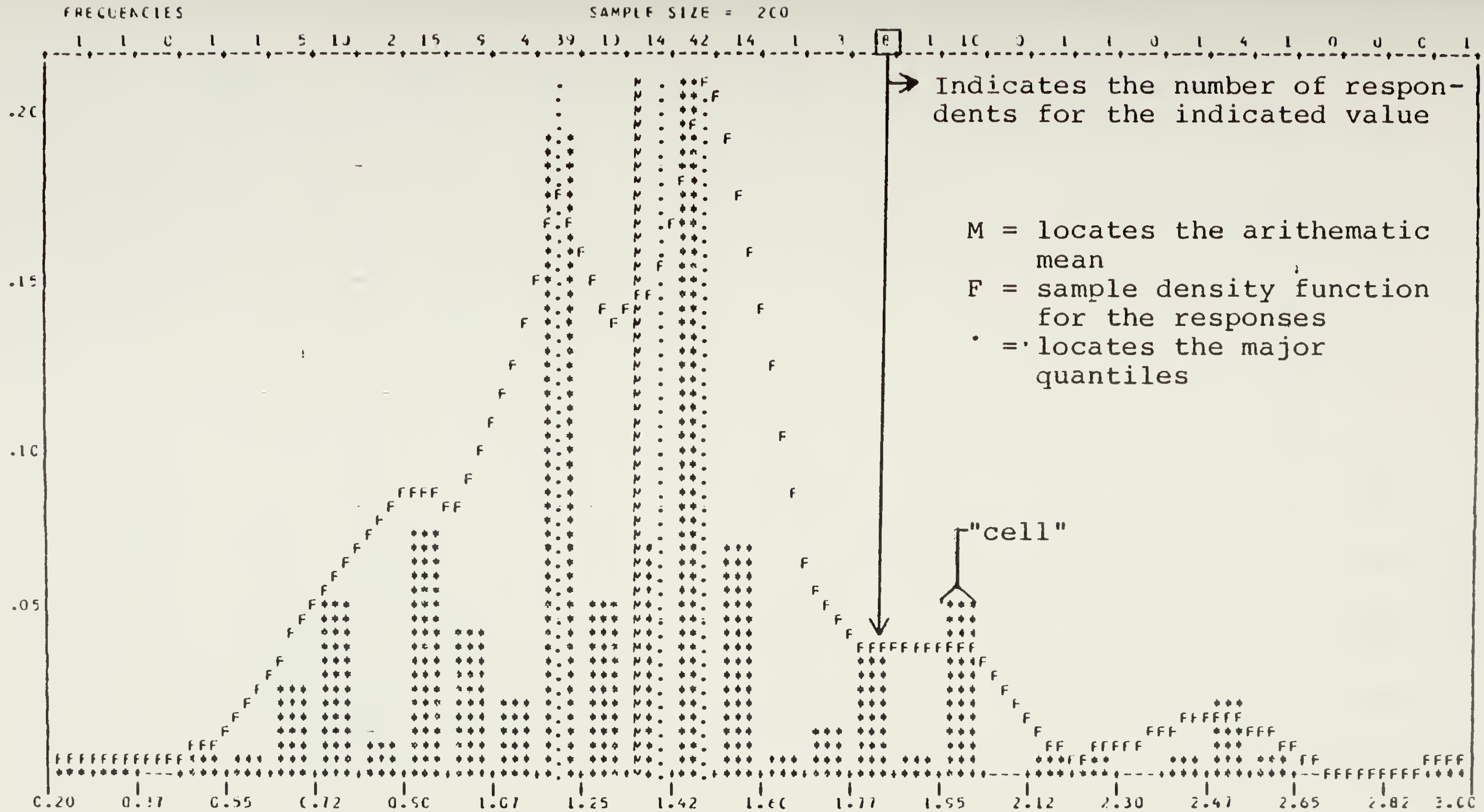
RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
51	1.40	1.60	1.80	0.100
52	1.50	2.00	2.50	0.150
53	1.50	2.10	2.50	0.100
54	0.90	1.00	1.60	0.100
55	0.95	1.30	1.50	0.100
56	1.20	1.80	2.00	0.070
57	1.60	1.90	2.30	0.100
58	1.80	2.00	2.50	0.050
59	1.50	1.90	2.50	0.200
60	1.25	1.50	2.50	0.075
61	0.90	1.40	1.80	0.150
62	2.50	2.60	3.00	0.150
63	1.00	1.70	1.90	0.080
64	1.80	1.90	2.50	0.100
65	1.20	1.70	1.80	0.200
66	2.00	2.50	2.80	0.075
67	0.75	2.50	3.00	0.100
68	0.98	1.40	1.80	0.050
69	2.50	3.30	3.50	0.400
70	0.70	2.00	2.50	0.150
71	2.00	3.00	3.50	0.075
72	1.50	2.00	2.50	0.100
73	1.50	3.00	4.50	0.070
74	1.50	1.80	2.30	0.050
75	1.30	2.00	3.00	0.090
76	0.75	1.30	0.60	0.125
77	1.50	1.90	3.00	0.200
78	1.10	1.20	1.40	0.200
79	1.20	1.80	2.00	0.100
80	1.80	2.00	2.50	0.100
81	1.60	1.80	2.20	0.130
82	1.20	1.50	2.50	0.150
83	1.50	2.00	2.20	0.100
84	1.20	1.60	1.80	0.050
85	0.98	1.80	2.50	0.150
86	1.50	2.00	3.00	0.100
87	1.80	1.60	2.50	0.200
88	0.70	1.40	2.70	0.080
89	1.20	1.70	2.20	0.100
90	1.00	1.30	1.70	0.150
91	1.40	1.60	2.40	0.075
92	0.80	1.75	2.00	0.150
93	1.20	2.00	3.00	0.050
94	1.20	1.80	2.20	0.125
95	1.20	1.60	2.50	0.100
96	1.50	1.80	3.00	0.100
97	1.50	2.00	2.50	0.080
98	2.50	3.00	3.50	0.050
99	1.20	1.50	1.70	0.100
100	1.50	1.80	2.70	0.100

FACTOR: DASH SPEED(MACH NO.)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
101	3.00	3.50	5.00	0.070
102	1.20	1.30	1.50	0.150
103	1.20	2.00	3.00	0.100
104	1.50	1.80	2.30	0.050
105	1.20	1.80	2.50	0.100
106	1.50	2.00	3.00	0.050
107	0.85	1.35	1.80	0.050
108	1.40	1.60	2.50	0.075
109	1.20	1.30	1.50	0.100
110	1.20	1.50	2.00	0.150
111	1.50	2.00	5.00	0.100
112	1.20	1.60	3.00	0.100
113	0.33	1.00	1.40	0.125
114	2.00	2.70	3.00	0.100
115	1.60	1.80	2.60	0.125
116	1.00	1.50	2.00	0.150
117	1.50	1.00	2.30	0.350
118	1.70	2.40	2.50	0.100
119	1.50	1.70	2.00	0.070
120	1.20	1.00	2.20	0.075
121	1.50	2.20	2.50	0.170
122	1.60	2.20	2.50	0.100
123	1.30	1.50	2.50	0.150
124	1.50	1.80	2.50	0.100
125	1.20	1.80	2.50	0.140
126	1.60	1.80	2.30	0.100
127	0.95	1.15	1.30	0.100
128	1.20	1.60	1.80	0.125
129	1.60	1.80	2.10	0.050
130	0.90	1.50	2.50	0.100
131	0.70	1.30	2.80	0.050
132	1.50	1.80	2.50	0.125
133	0.75	2.20	2.50	0.200
134	1.50	1.70	2.00	0.400
135	1.20	1.70	3.50	0.100
136	1.80	2.30	2.60	0.070
137	1.50	2.70	3.20	0.350
138	1.50	1.80	2.50	0.150
139	1.30	1.50	1.30	0.125
140	1.20	1.40	1.60	0.050
141	1.40	1.80	2.50	0.100
142	1.50	2.00	3.00	0.070
143	2.00	2.40	2.50	0.050
144	1.50	2.20	2.50	0.100
145	2.00	2.80	3.20	0.135
146	1.00	1.60	2.10	0.100
147	1.30	1.25	2.80	0.030
148	1.50	1.80	2.50	0.150
149	1.40	1.60	2.00	0.020
150	1.40	1.50	1.70	0.100

FACTOR: DASH SPEED(MACH NO.)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
151	1.10	2.00	2.50	0.050
152	1.80	2.40	2.70	0.160
153	2.20	3.00	3.50	0.200
154	1.50	2.00	2.50	0.100
155	2.30	2.50	3.50	0.050
156	1.20	1.50	2.50	0.060
157	1.50	1.70	2.50	0.090
158	1.80	2.20	2.30	0.120
159	1.50	2.50	3.50	0.100
160	0.95	1.10	1.50	0.150
161	1.00	1.50	2.00	0.150
162	1.00	1.80	2.50	0.135
163	1.60	2.00	2.50	0.085
164	1.30	1.60	2.90	0.150
165	1.40	1.60	2.00	0.010
166	0.85	1.10	1.20	0.100
167	1.20	1.60	2.00	0.075
168	2.00	2.50	3.50	0.100
169	0.80	1.80	2.00	0.200
170	1.50	2.30	2.50	0.100
171	0.20	1.60	1.80	0.075
172	1.50	1.50	2.90	0.100
173	0.94	2.20	3.00	0.115
174	1.20	1.60	2.00	0.100
175	0.75	1.20	1.50	0.100
176	1.60	1.70	2.00	0.100
177	1.20	1.50	1.70	0.100
178	1.20	1.80	2.20	0.150
179	1.50	1.80	2.50	0.090
180	1.20	1.80	2.40	0.100
181	2.50	3.00	3.50	0.150
182	1.40	2.20	2.60	0.100
183	1.80	2.50	2.50	0.050
184	1.70	1.90	2.60	0.025
185	1.70	1.90	2.30	0.050
186	2.00	2.50	2.70	0.190
187	1.20	1.60	2.20	0.100
188	1.30	1.30	2.00	0.040
189	1.50	2.00	2.50	0.100
190	1.50	2.00	2.50	0.150
191	1.20	1.20	1.50	0.050
192	2.40	2.50	3.00	0.050
193	0.80	2.10	2.70	0.150
194	1.20	1.60	2.00	0.100
195	1.00	2.50	2.00	0.100
196	1.50	1.50	2.00	0.100
197	0.80	2.00	3.00	0.100
198	1.20	1.50	2.50	0.150
199	1.30	1.50	2.00	0.100
200	1.20	1.70	2.50	0.100

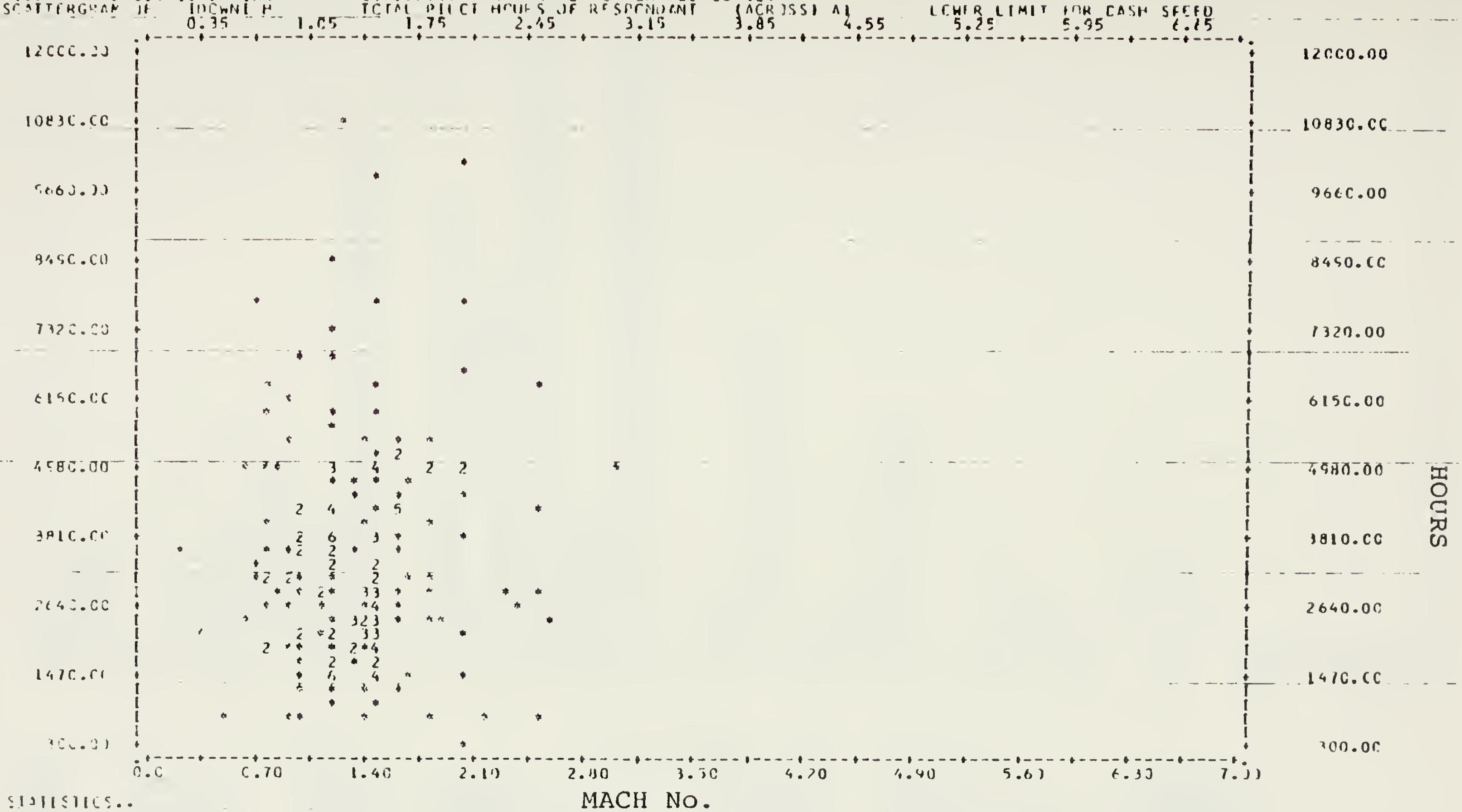


CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.3664999E 00	VARIANCE	1.7756845E-01	M3	4.6734335E-02	MINIMUM	2.0000000E-01
MEDIAN	1.4000000E 00	STD DEV	4.2138887E-01	M4	1.4127077E-01	.10 QUANTILE	8.5000000E-01
TRIMEAN	1.3749999E 00	COEF VAR	3.0973009E-01	SKEWNESS	6.2457953E-01	.25 QUANTILE (HINGE)	1.2000000E 00
MIDMEAN	1.3515000E 00	MEAN DEV	3.1660000E-01	KURTOSIS	1.4804388E 00	.50 QUANTILE (MEDIAN)	1.4000000E 00
MIDRANGE	1.5999999E 00	RANGE	2.7999999E 00	BETA1	4.6035656E-02	.75 QUANTILE (HINGE)	1.5000000E 00
GEOM MEAN	1.2913134E 00	MIDSPREAD	3.0000002E-01	BETA2	1.3953842E-01	.90 QUANTILE	1.7999999E 00
HARM MEAN	1.2045049E 00					MAXIMUM	3.0000000E 00

LOWER LIMIT FOR DASH SPEED

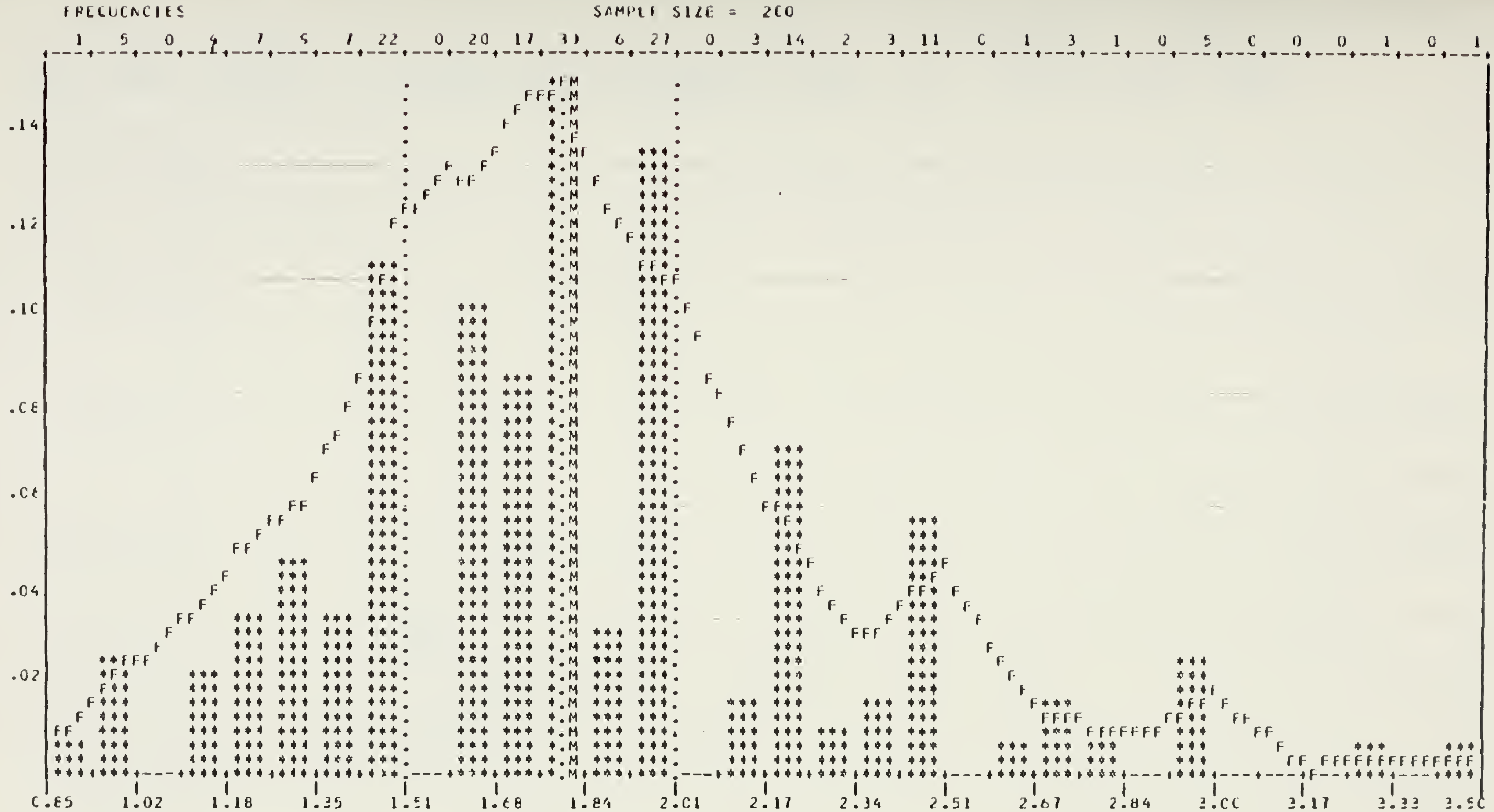
LT. PATRICK M. O'CONNELL 07/26/77

FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDENT (ACROSS) A1 LOWER LIMIT FOR DASH SPEED



STATISTICS..

CORRELATION (R) -	0.04981	R SQUARED -	0.00248	SIGNIFICANCE -	0.24238
STD ERR OF EST -	1805.75942	INTERCEPT (A) -	3250.07957	SLOPE (B) -	214.66190
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.627250E 00	VARIANCE	2.093667E-01	M3	7.376721E-02	MINIMUM	8.500000E-01
MEDIAN	1.755555E 00	STD DEV	4.575661E-01	M4	1.750408E-01	.10 QUANTILE	1.255555E 00
TRIMEAN	1.775000E 00	COEF VAR	2.504125E-01	SKEWNESS	7.702287E-01	.25 QUANTILE (HINGE)	1.500000E 00
MIDMEAN	1.780455E 00	MEAN DEV	3.397500E-01	KURTOSIS	9.534072E-01	.50 QUANTILE (MEDIAN)	1.755555E 00
MIDRANGE	2.174555E 00	RANGE	2.650000E 00	BETA1	7.268411E-02	.75 QUANTILE (HINGE)	2.000000E 00
GEOM MEAN	1.772572E 00	MIDSPREAD	5.000000E-01	BETA2	1.726531E-01	.90 QUANTILE	2.500000E 00
HARM MEAN	1.718545E 00					MAXIMUM	3.500000E 00

FIFTIETH UTILE FOR DASH SPEED

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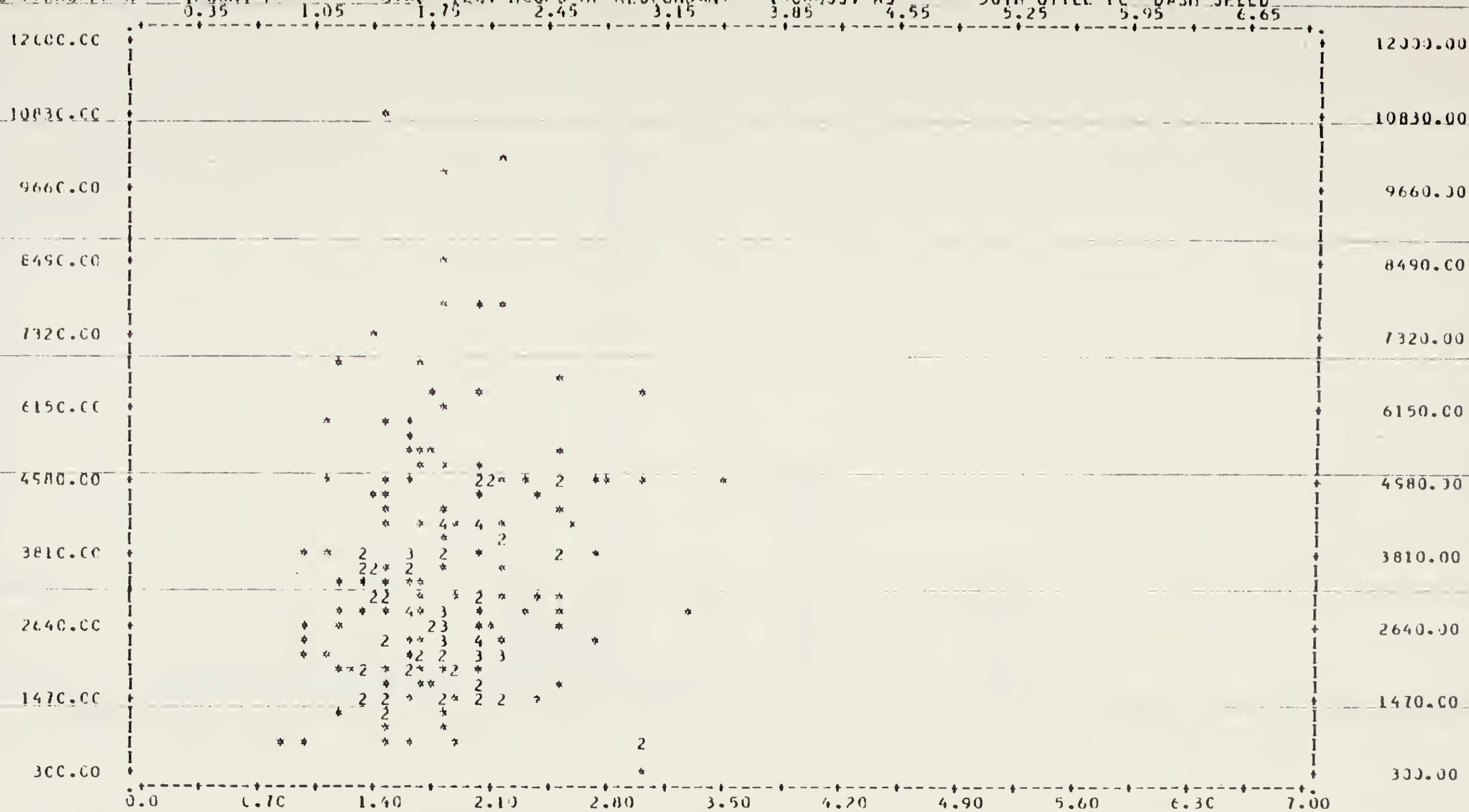
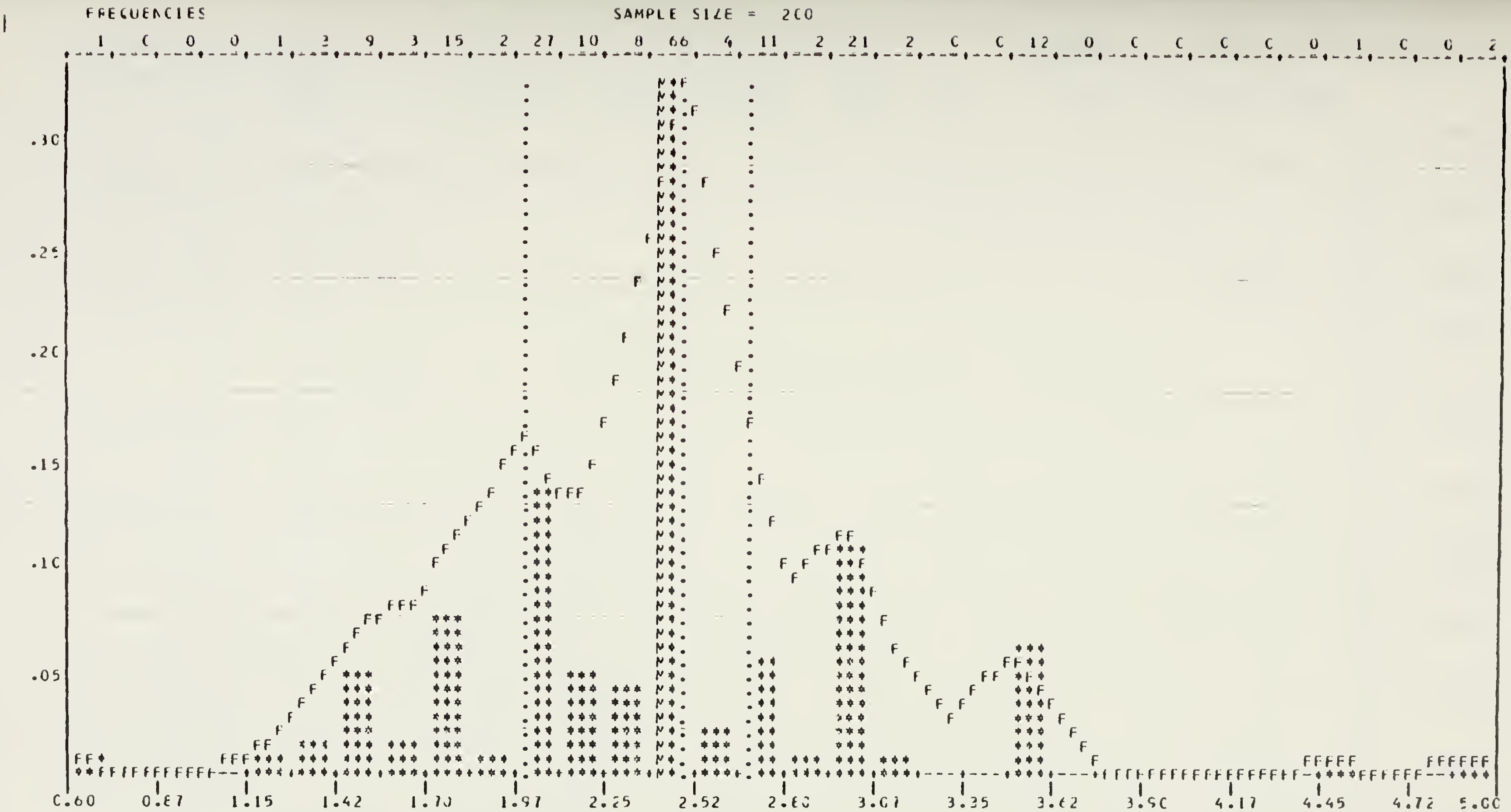
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) P TOTAL PILOT HOURS OF RESPONDANT (ACROSS) A3 50TH %TILE 100 DASH SPEED



STATISTICS..

CORRELATION (R)-	0.09612	R SQUARED -	0.00924	SIGNIFICANCE -	0.08842
STD ERR OF EST -	1803.64869	INTERCEPT (A) -	2850.13791	SLOPE (B) -	379.22127
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	2.4295000E 00	VARIANCE	3.6229512E-01	M3	1.8052576E-01	MINIMUM	6.0000000E-01
MEDIAN	2.5000000E 00	STD DEV	6.0190630E-01	M4	7.8261870E-01	.10 QUANTILE	1.7000000E 00
TRIMEAN	2.4249999E 00	COEF VAR	2.4774908E-01	SKEWNESS	8.2765130E-01	.25 QUANTILE (HINGE)	2.0000000E 00
MIDMEAN	2.4009999E 00	MEAN DEV	4.1950010E-01	KURTOSIS	2.5625880E 00	.50 QUANTILE (MEDIAN)	2.5000000E 00
MIDRANGE	2.7999999E 00	RANGE	4.4000000E 00	BETA1	1.7782690E-01	.75 QUANTILE (HINGE)	2.7000000E 00
GEOM MEAN	2.3551410E 00	MIDSPREAD	6.9999980E-01	BETA2	7.7067480E-01	.90 QUANTILE	3.0000000E 00
HARM MEAN	2.2728070E 00					MAXIMUM	5.0000000E 00

UPPER LIMIT FOR DASH SPEED

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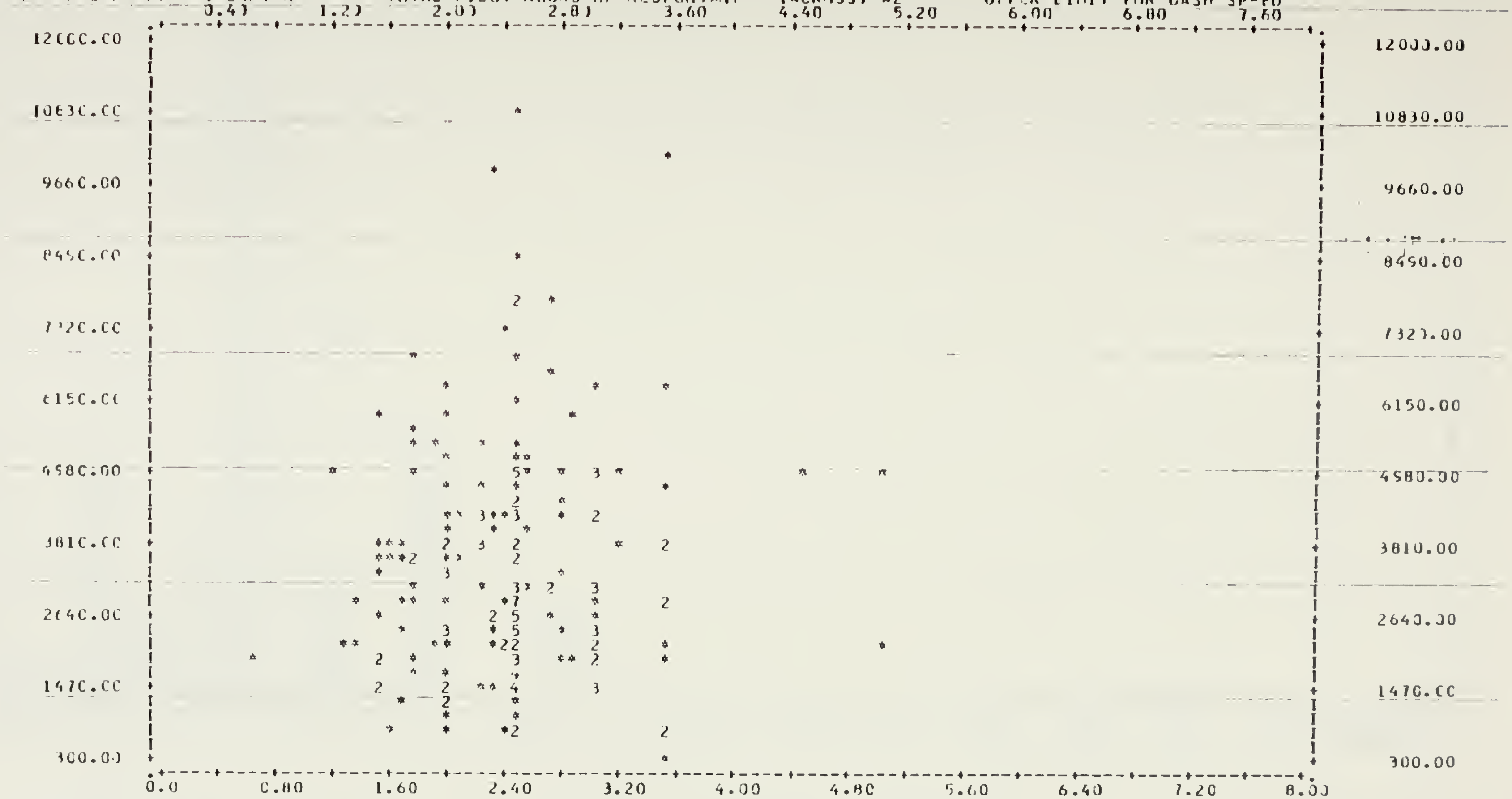
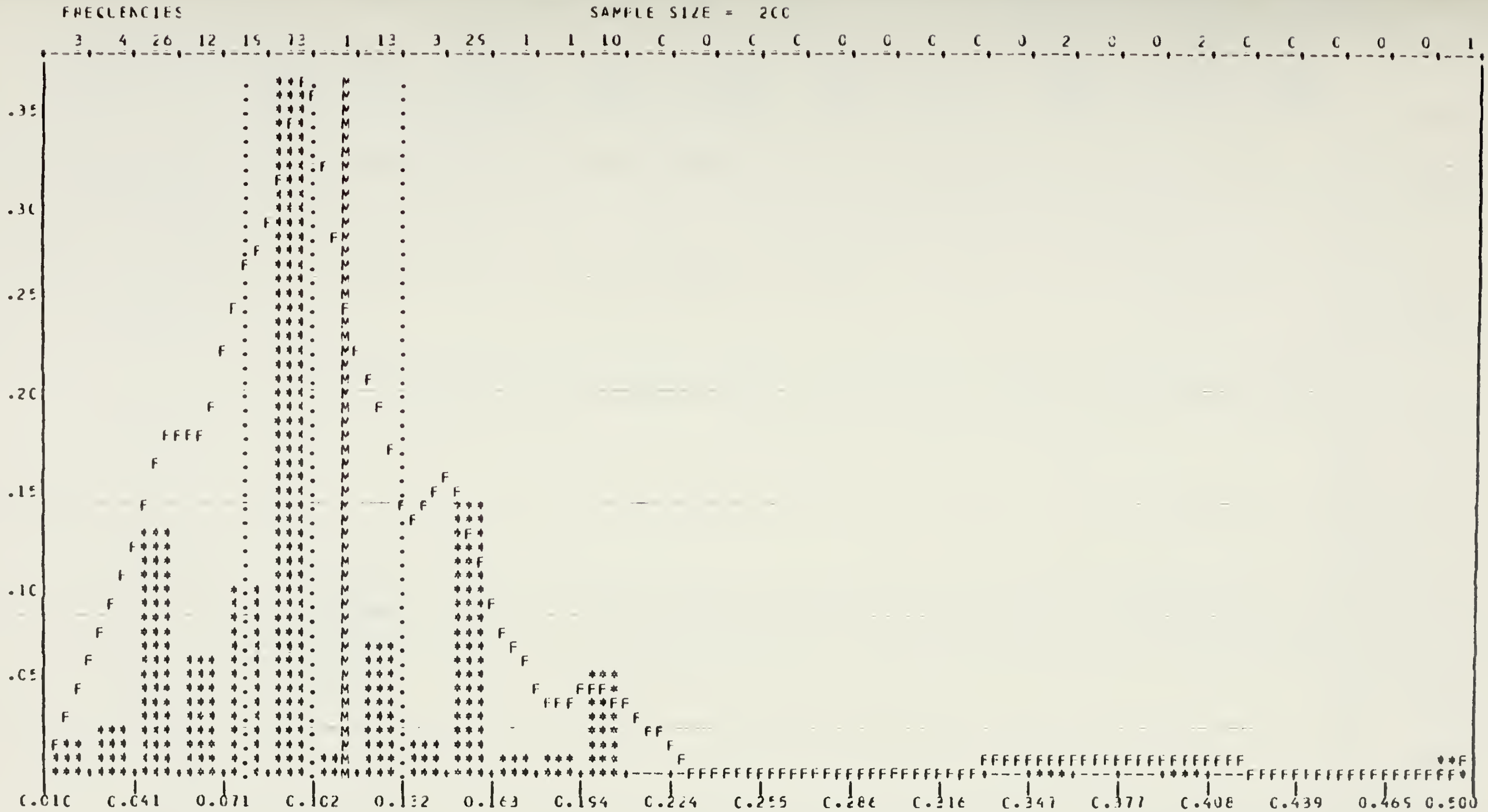
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) A2 UPPER LIMIT FOR DASH SPEED



STATISTICS..

CORRELATION (R)-	0.06616	R SQUARED -	0.00438	SIGNIFICANCE -	0.17660
STD ERR OF EST -	1808.06888	INTERCEPT (A) -	3061.23294	SLOPE (B) -	198.42038
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.096150E-01	VARIANCE	3.874870E-03	M3	6.870583E-04	MINIMUM	9.999998E-03
MEDIAN	9.999996E-02	STD DEV	6.224845E-02	M4	2.324761E-04	.10 QUANTILE	5.000000E-02
TRIMEAN	1.012499E-01	COEF VAR	5.678827E-01	SKEWNESS	2.848446E 00	.25 QUANTILE (HINGE)	7.499999E-02
MIDMEAN	9.987992E-02	MEAN DEV	3.618459E-02	KURTOSIS	1.248332E 01	.50 QUANTILE (MEDIAN)	9.999996E-02
MIDRANGE	2.550000E-01	RANGE	4.899999E-01	BETA1	6.767870E-04	.75 QUANTILE (HINGE)	1.300000E-01
GEOM MEAN	9.676903E-02	MIDSPREAD	5.500001E-02	BETA2	2.262738E-04	.90 QUANTILE	1.500000E-01
HARM MEAN	8.399904E-02					MAXIMUM	5.000000E-01

WEIGHT GIVEN TO EASH SPEED

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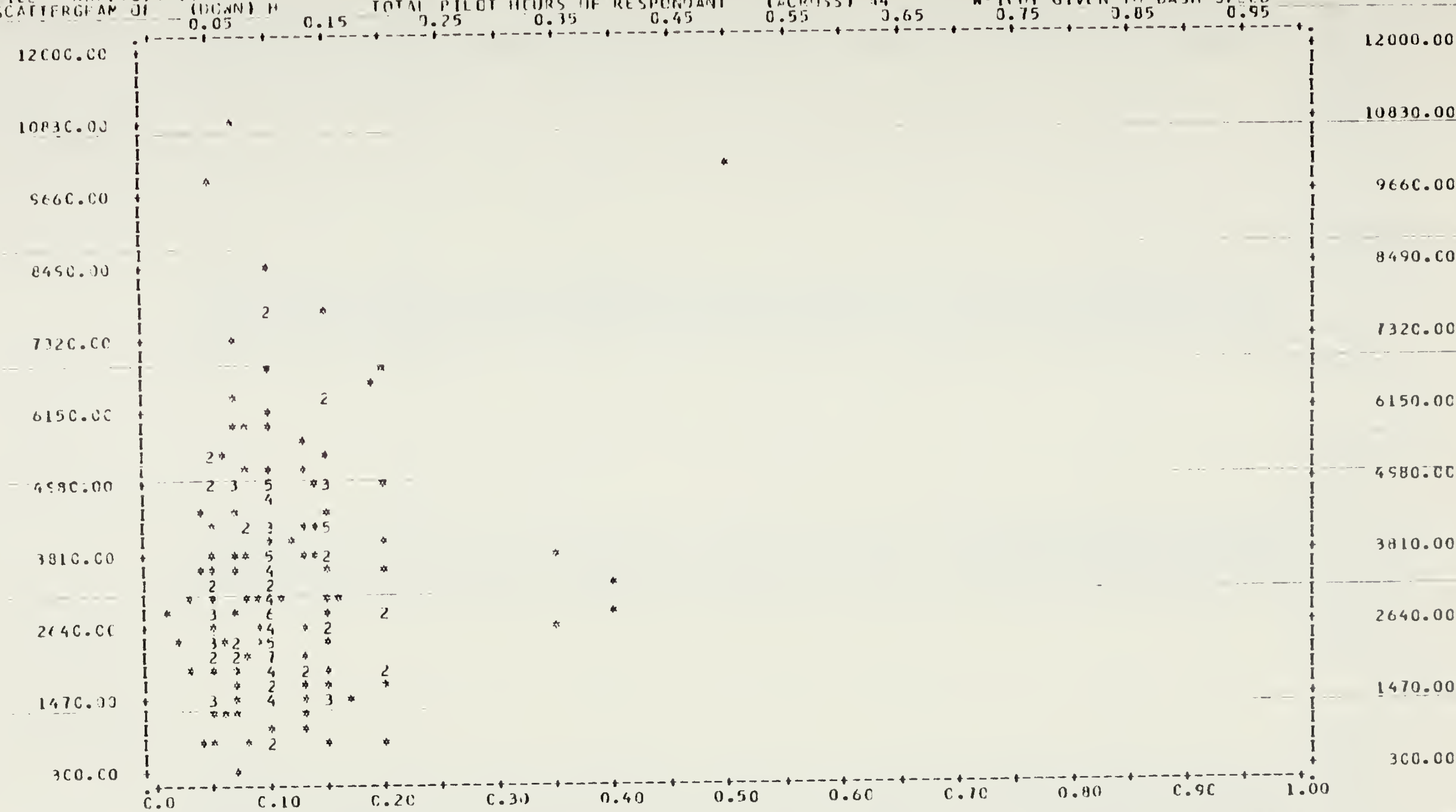
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY

SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) A4 WEIGHT GIVEN TO DASH SPEED



STATISTICS..

CORRELATION (R)-	0.13756	R SQUARED -	0.01892	SIGNIFICANCE -	0.02634
STD ERR OF EST -	1754.81204	INTERCEPT (A) -	3107.30775	SLOPE (B) -	3988.46161
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0

FACTOR: ACCELERATION (THRUST TO WEIGHT RATIO; WEIGHT=1.00 IN ALL CA

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
1	1.00	1.10	2.00	0.125
2	1.00	1.10	1.30	0.100
3	0.70	1.00	2.00	0.050
4	1.40	2.30	3.00	0.075
5	0.80	1.00	1.20	0.200
6	0.85	1.00	1.20	0.200
7	0.60	0.83	1.20	0.150
8	0.75	0.95	1.40	0.100
9	0.60	1.00	2.00	0.250
10	1.00	1.25	1.40	0.100
11	1.00	1.50	2.00	0.120
12	1.00	2.00	3.00	0.150
13	1.00	1.10	1.50	0.150
14	1.00	1.40	2.00	0.150
15	0.90	0.90	1.60	0.050
16	0.67	1.00	2.50	0.100
17	0.75	1.50	2.00	0.100
18	1.00	1.50	2.00	0.150
19	1.00	1.00	1.20	0.200
20	0.80	0.80	1.30	0.200
21	0.90	1.30	1.50	0.125
22	0.50	0.70	1.00	0.150
23	1.00	1.00	1.00	0.100
24	1.00	1.40	1.70	0.200
25	0.90	1.00	1.30	0.050
26	1.00	1.10	3.00	0.100
27	0.80	1.00	1.50	0.100
28	1.00	1.10	1.40	0.090
29	0.67	0.83	1.00	0.150
30	0.88	0.95	1.05	0.120
31	1.00	1.50	2.50	0.185
32	0.80	1.50	2.00	0.100
33	1.50	2.00	3.00	0.150
34	1.00	1.20	1.50	0.100
35	1.10	1.40	1.60	0.120
36	1.20	1.35	1.50	0.150
37	0.83	1.00	1.40	0.040
38	1.00	2.00	2.00	0.150
39	0.80	1.00	1.40	0.100
40	0.75	1.20	2.00	0.100
41	0.30	0.70	1.20	0.083
42	1.00	1.75	2.00	0.150
43	0.60	0.90	1.20	0.115
44	1.00	1.50	2.00	0.200
45	0.90	1.00	1.50	0.150
46	0.50	0.71	1.00	0.100
47	1.00	1.00	1.20	0.100
48	1.00	2.00	2.00	0.030
49	0.77	0.91	1.10	0.200
50	1.00	1.20	1.30	0.100

FACTOR: ACCELERATION (THRUST TO WEIGHT RATIO; WEIGHT=1.00 IN ALL CA

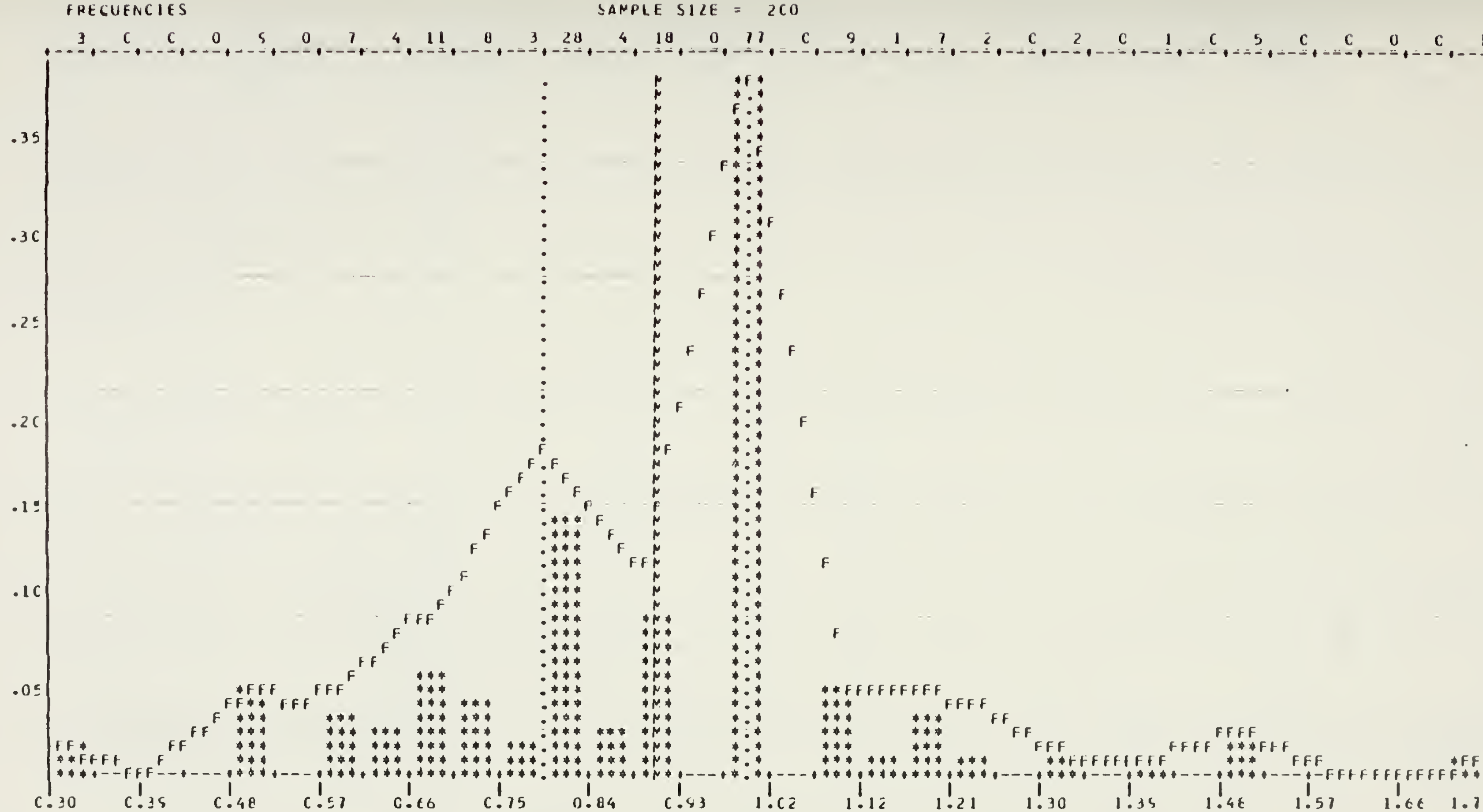
RESPONDANT	LOWER LIMIT	FIFTIETH UTILE	UPPER LIMIT	WEIGHT
51	1.00	1.40	1.50	0.075
52	0.80	1.00	2.00	0.100
53	1.50	1.70	2.00	0.150
54	0.70	0.90	1.30	0.075
55	0.75	0.90	1.00	0.100
56	0.70	0.85	1.00	0.100
57	1.00	1.10	1.20	0.125
58	1.00	1.10	2.00	0.100
59	0.90	1.00	1.30	0.125
60	0.75	0.90	1.50	0.100
61	0.80	1.00	1.50	0.050
62	1.00	1.50	3.00	0.100
63	0.90	1.00	2.00	0.025
64	1.20	1.40	1.80	0.200
65	1.50	1.70	2.50	0.150
66	1.00	1.30	1.50	0.200
67	0.83	0.90	1.00	0.200
68	0.70	1.10	1.50	0.150
69	1.00	1.80	2.00	0.200
70	0.80	1.40	1.50	0.300
71	1.00	1.50	2.00	0.250
72	0.75	1.00	1.50	0.100
73	1.00	1.25	1.50	0.150
74	0.80	1.00	1.50	0.100
75	0.80	1.30	2.00	0.200
76	1.00	1.20	1.60	0.175
77	0.80	1.00	1.60	0.200
78	0.80	1.00	1.20	0.200
79	1.10	1.30	1.50	0.100
80	1.00	1.20	1.50	0.150
81	0.80	1.00	1.25	0.150
82	0.50	0.90	1.20	0.150
83	1.00	1.00	1.50	0.100
84	1.50	1.80	2.00	0.250
85	0.50	0.60	1.00	0.100
86	0.60	0.75	1.20	0.150
87	0.77	0.80	1.50	0.250
88	1.75	1.00	1.50	0.160
89	0.75	1.00	1.50	0.150
90	0.80	0.90	1.00	0.150
91	0.90	1.00	1.30	0.200
92	0.66	0.76	1.00	0.300
93	0.30	0.60	1.00	0.150
94	1.10	1.50	1.30	0.125
95	1.00	1.00	1.25	0.100
96	0.90	1.00	2.00	0.100
97	0.80	1.00	1.50	0.125
98	1.00	1.00	2.00	0.600
99	0.80	1.00	1.50	0.100
100	0.67	0.76	1.00	0.100

FACTOR: ACCELERATION (THRUST TO WEIGHT RATIO; WEIGHT=1.00 IN ALL CA

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
101	1.00	1.50	3.00	0.100
102	1.00	1.10	1.20	0.150
103	0.90	0.90	2.50	0.100
104	1.00	1.30	1.50	0.150
105	0.80	1.00	1.50	0.100
106	1.00	1.50	2.00	0.100
107	0.50	0.66	1.00	0.100
108	0.90	1.11	1.50	0.150
109	0.80	1.00	1.50	0.200
110	1.00	1.30	2.00	0.200
111	1.00	1.30	2.00	0.100
112	1.00	1.50	3.00	0.150
113	0.50	0.75	1.00	0.275
114	1.00	1.20	1.50	0.175
115	0.60	0.90	1.50	0.150
116	0.30	0.50	1.00	0.200
117	0.50	1.00	1.00	0.050
118	1.00	1.10	1.50	0.100
119	1.10	1.70	2.00	0.105
120	0.80	1.00	1.70	0.075
121	0.90	1.00	1.25	0.070
122	1.20	1.50	2.00	0.200
123	0.70	1.50	2.00	0.220
124	1.00	1.20	2.00	0.150
125	0.80	1.20	1.50	0.140
126	0.90	0.95	1.00	0.200
127	1.00	1.20	1.50	0.200
128	0.85	1.00	1.50	0.125
129	0.71	0.83	1.00	0.040
130	0.90	1.00	1.50	0.300
131	0.80	1.40	2.00	0.150
132	0.90	1.30	2.00	0.125
133	1.00	1.00	3.00	0.200
134	1.00	1.20	1.50	0.300
135	1.20	1.50	3.00	0.100
136	1.00	1.20	1.50	0.365
137	1.00	1.20	1.80	0.050
138	1.30	1.50	2.00	0.200
139	1.00	1.20	1.50	0.250
140	1.20	1.20	2.00	0.050
141	0.80	1.10	1.40	0.100
142	1.15	1.50	3.00	0.105
143	1.00	1.80	2.00	0.080
144	0.86	0.91	1.10	0.100
145	1.00	1.50	2.00	0.150
146	1.10	1.20	1.35	0.150
147	0.76	0.90	1.60	0.050
148	1.00	1.00	1.50	0.250
149	1.10	1.20	1.40	0.200
150	1.10	1.20	1.30	0.150

FACTOR: ACCELERATION (THRUST TO WEIGHT RATIO; WEIGHT=1.00 IN ALL CA

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
151	1.20	1.50	1.70	0.050
152	1.00	1.30	1.50	0.175
153	1.00	2.00	3.00	0.150
154	1.00	1.50	2.00	0.100
155	1.00	1.20	1.50	0.050
156	0.65	0.75	1.25	0.150
157	1.00	1.20	1.70	0.110
158	0.90	1.00	1.10	0.200
159	1.00	1.70	2.50	0.100
160	1.00	1.00	1.50	0.150
161	0.66	0.83	1.00	0.150
162	1.00	1.50	2.00	0.090
163	1.10	1.20	2.00	0.115
164	0.90	1.00	1.50	0.150
165	1.00	1.25	2.00	0.300
166	1.00	1.00	2.00	0.100
167	1.00	1.00	1.50	0.150
168	1.00	1.50	2.00	0.100
169	0.50	0.66	1.00	0.300
170	1.25	1.50	1.75	0.150
171	1.00	1.50	2.00	0.075
172	1.25	1.30	1.50	0.050
173	1.00	1.00	1.25	0.100
174	0.50	0.80	1.50	0.100
175	0.80	1.00	1.40	0.150
176	1.00	1.20	1.50	0.300
177	1.00	1.30	1.50	0.100
178	1.00	1.30	1.40	0.200
179	0.90	1.00	1.20	0.170
180	0.80	1.00	2.00	0.100
181	0.67	0.70	1.00	0.050
182	0.60	1.20	3.00	0.100
183	1.00	1.30	1.50	0.050
184	1.30	1.60	1.90	0.080
185	1.10	1.10	1.30	0.150
186	1.00	1.50	2.00	0.140
187	0.80	0.90	1.20	0.150
188	1.00	1.00	2.00	0.100
189	0.66	0.83	1.00	0.150
190	1.00	1.50	2.00	0.100
191	1.00	1.20	1.50	0.150
192	1.00	1.25	1.50	0.100
193	0.90	1.20	1.80	0.150
194	0.60	1.00	2.00	0.150
195	1.20	1.20	1.40	0.150
196	1.50	2.00	3.00	0.200
197	0.80	1.50	2.00	0.150
198	1.00	1.11	1.17	0.200
199	0.70	0.90	1.30	0.150
200	0.70	0.90	1.20	0.150



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	9.118459E-01	VARIANCE	4.790256E-02	M3	2.070393E-03	MINIMUM	3.000000E-01
MEDIAN	1.000000E 00	STD DEV	2.188665E-01	M4	1.059187E-02	.10 QUANTILE	6.500000E-01
TRIMEAN	9.499998E-01	COEF VAR	2.400247E-01	SKEWNESS	1.974762E-01	.25 QUANTILE (HINGE)	7.999997E-01
MIDMEAN	9.309999E-01	MEAN DEV	1.601459E-01	KURTOSIS	1.615888E 00	.50 QUANTILE (MEDIAN)	1.000000E 00
MIDRANGE	1.025000E 00	RANGE	1.450000E 00	BETA1	2.039441E-03	.75 QUANTILE (HINGE)	1.000000E 00
GEOM MEAN	8.831071E-01	MIDSPREAD	2.000003E-01	BETA2	1.044836E-02	.90 QUANTILE	1.099999E 00
HARM MEAN	8.459698E-01					MAXIMUM	1.750000E 00

LOWER LIMIT FOR THRUST TO WEIGHT RATIO

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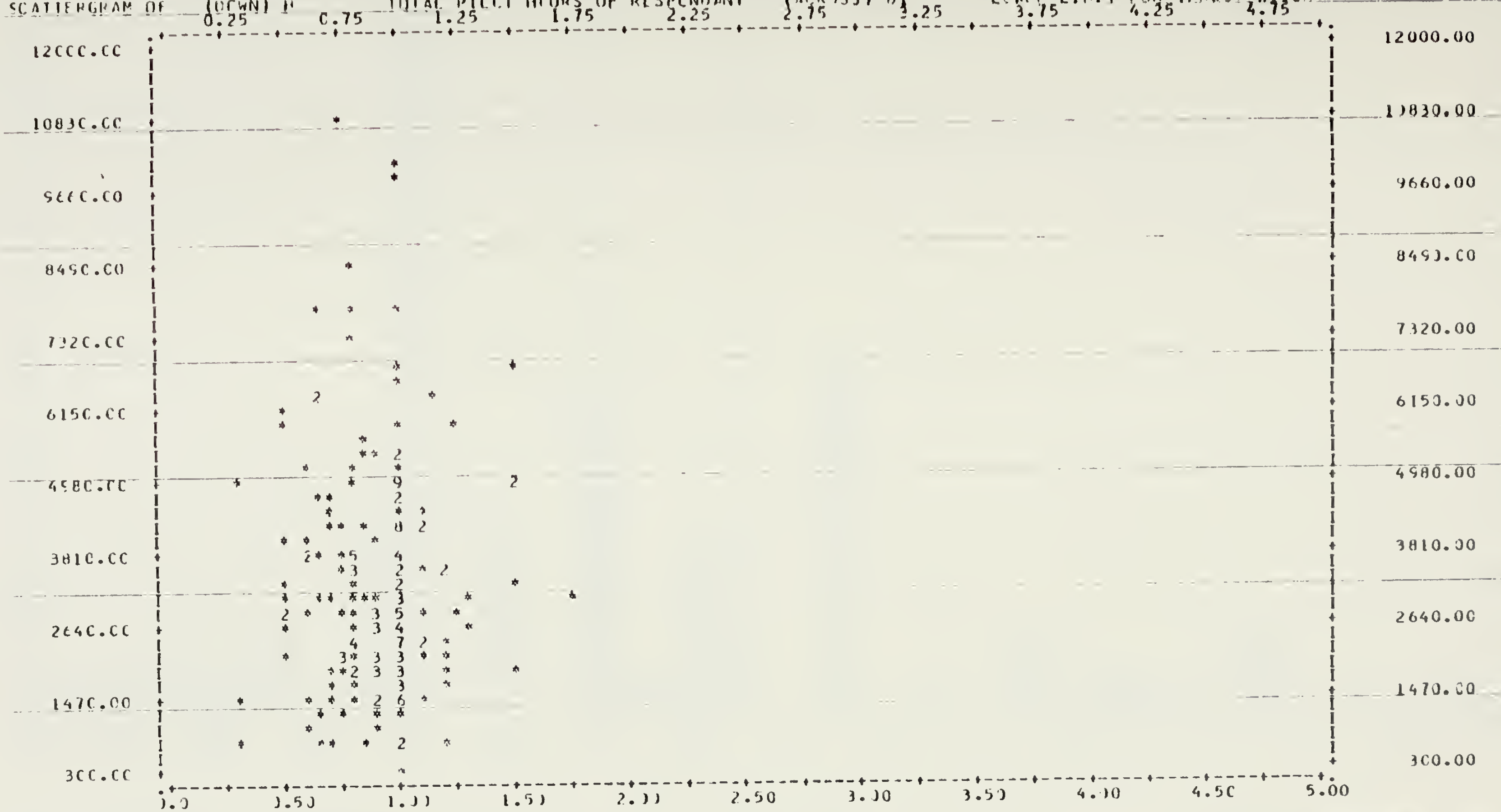
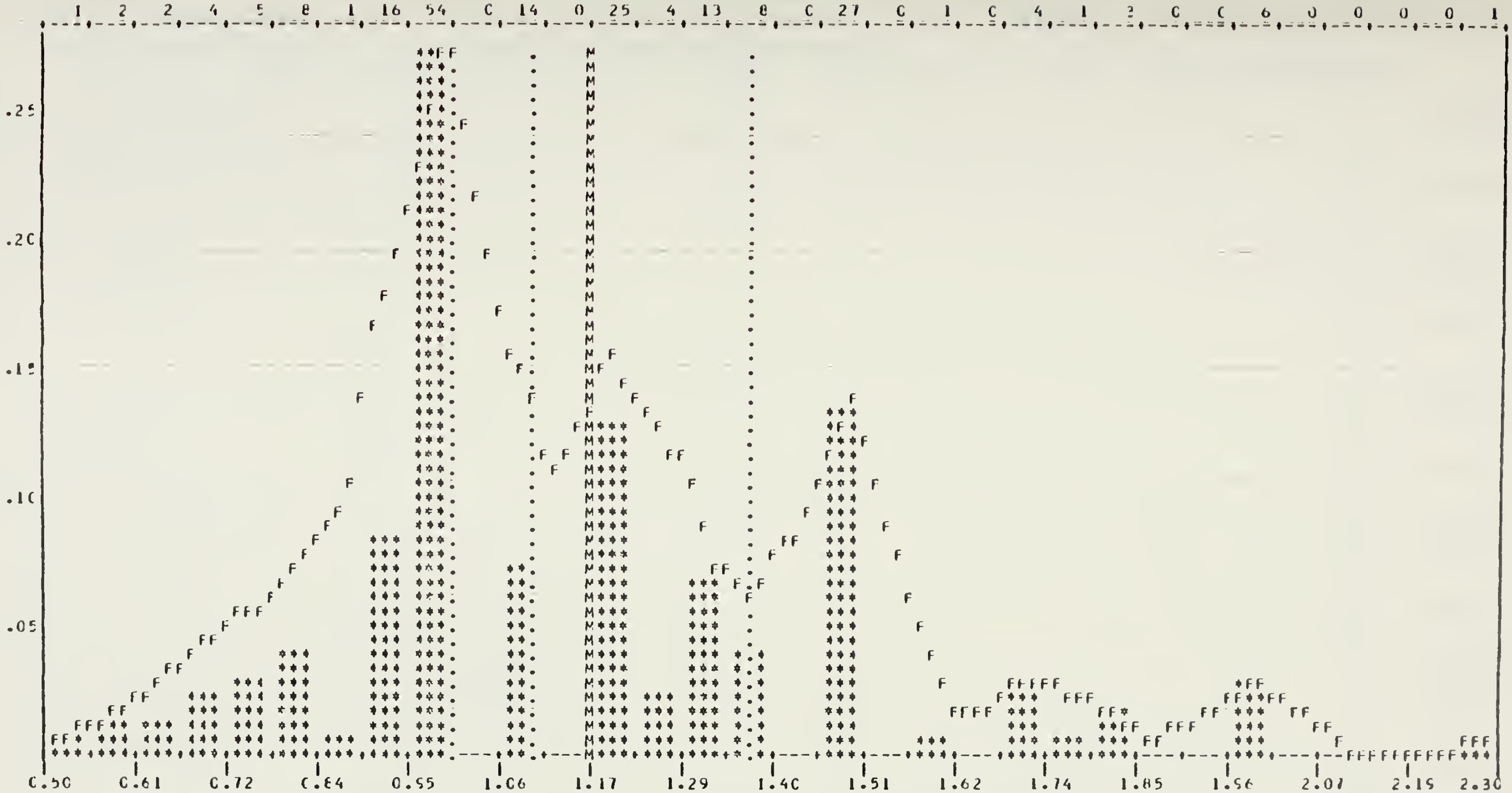
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) P TOTAL PILOT HOURS OF RESPONDANT (ACROSS) B) LOWER LIMIT FOR THRUST-WEIGHT



STATISTICS..

CORRELATION (R)-	0.02554	R SQUARED -	0.00065	SIGNIFICANCE -	0.36012
STD ERR OF EST -	1811.44748	INTERCEPT (A) -	3349.88813	SLOPE (B) -	213.11413
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0

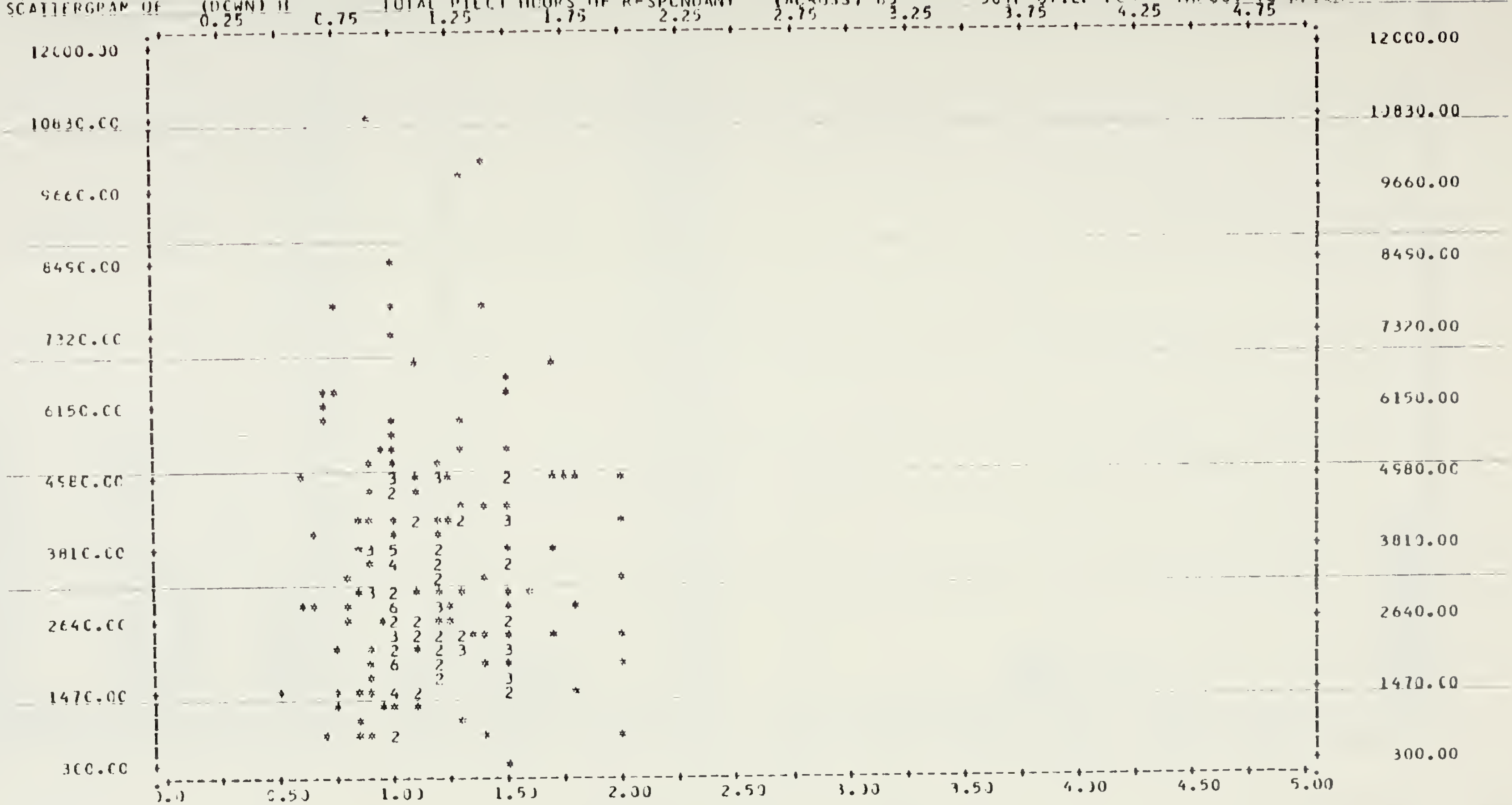
FREQUENCIES SAMPLE SIZE = 200



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.170449E 00	VARIANCE	9.621727E-02	M3	2.475142E-02	MINIMUM	5.000000E-01
MEDIAN	1.099999E 00	STD DEV	3.101851E-01	M4	3.495057E-02	.10 QUANTILE	8.300000E-01
TRIMEAN	1.143749E 00	COEF VAR	2.650171E-01	SKEWNESS	8.293175E-01	.25 QUANTILE (HINGE)	1.000000E 00
MIDMEAN	1.116549E 00	MEAN DEV	2.407458E-01	KURTOSIS	7.752705E-01	.50 QUANTILE (MEDIAN)	1.099999E 00
MIDRANGE	1.400000E 00	RANGE	1.799999E 00	BETA1	2.431305E-02	.75 QUANTILE (HINGE)	1.374999E 00
GEOM MEAN	1.131661E 00	MIDSPREAD	3.749990E-01	BETA2	3.452722E-02	.90 QUANTILE	1.500000E 00
HARM MEAN	1.094765E 00					MAXIMUM	2.299999E 00

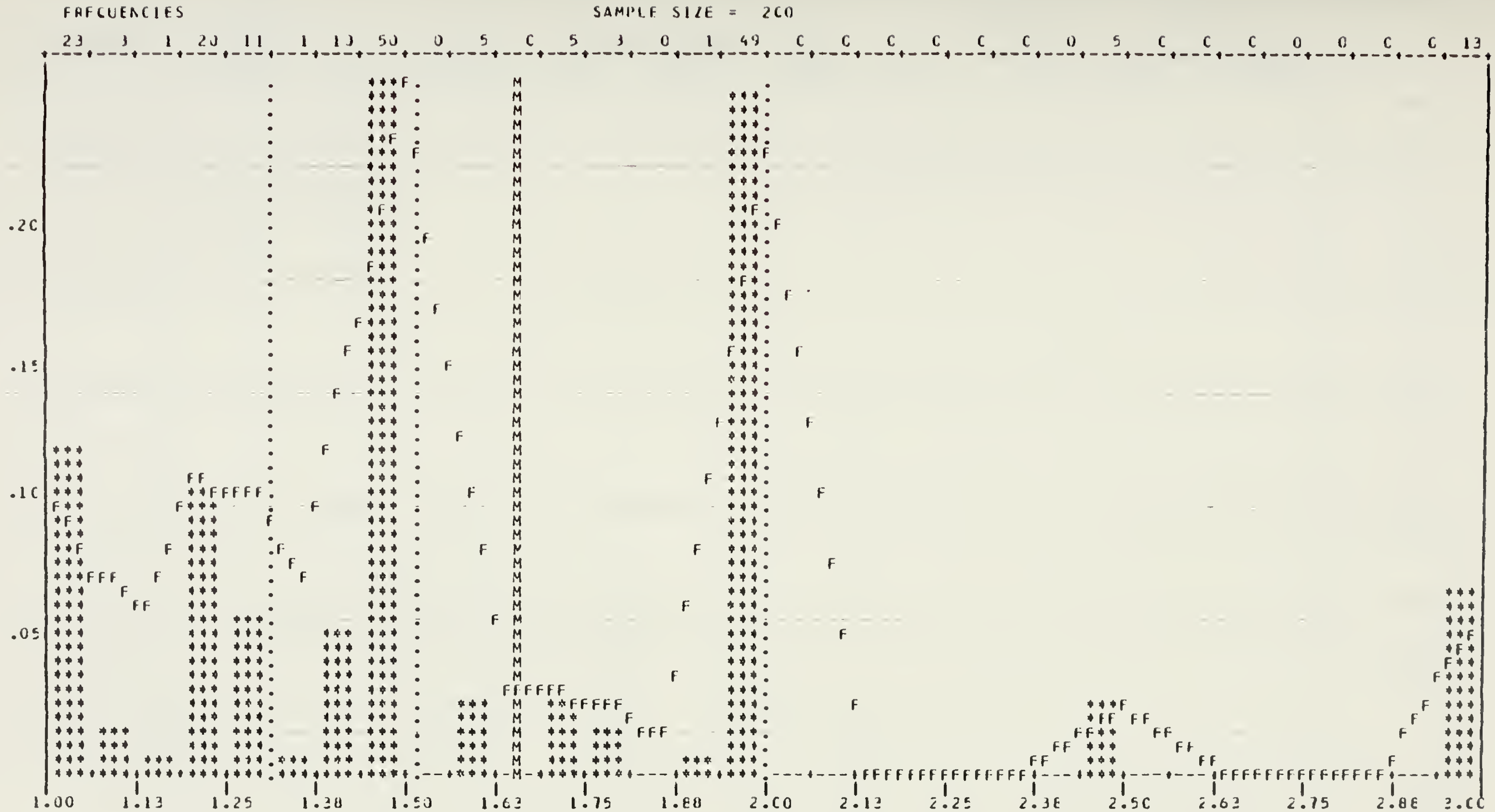
FIFTIETH UTILE FOR THRUST TO WEIGHT RATIO

FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) B3 50TH %TILE FOR THRUST TO WEIGHT



STATISTICS..

CORRELATION (R)-	0.00482	R SQUARED -	0.00002	SIGNIFICANCE -	0.47339
STD ERR OF EST -	1812.01775	INTERCEPT (A) -	3509.34409	SLOPE (B) -	28.97505
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.646645E 00	VARIANCE	2.577268E-01	M3	1.420335E-01	MINIMUM	1.000000E 00
MEDIAN	1.500000E 00	STD DEV	5.076680E-01	M4	2.634054E-01	.10 QUANTILE	1.000000E 00
TRIMEAN	1.575000E 00	COEF VAR	3.078923E-01	SKEWNESS	1.085553E 00	.25 QUANTILE (HINGE)	1.255555E 00
MIDMEAN	1.565555E 00	MEAN DEV	3.656500E-01	KURTOSIS	9.656324E-01	.50 QUANTILE (MEDIAN)	1.500000E 00
MIDRANGE	2.000000E 00	RANGE	2.000000E 00	BETA1	1.355102E-01	.75 QUANTILE (HINGE)	2.000000E 00
GEOM MEAN	1.575576E 00	MIDSPREAD	7.000008E-01	BETA2	2.601151E-01	.90 QUANTILE	2.000000E 00
HARM MEAN	1.517562E 00					MAXIMUM	3.000000E 00

UPPER LIMIT FOR THRUST TO WEIGHT RATIO

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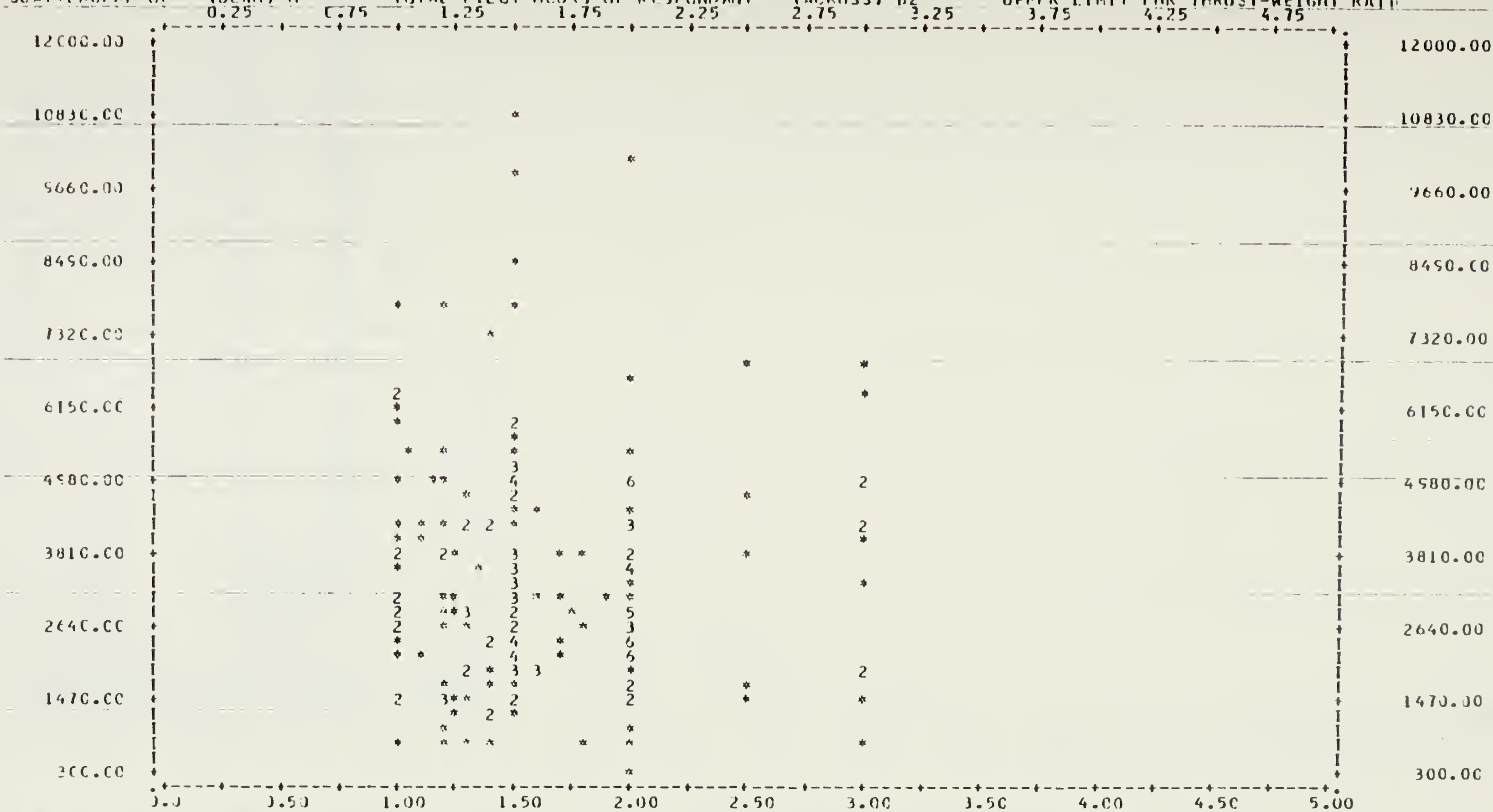
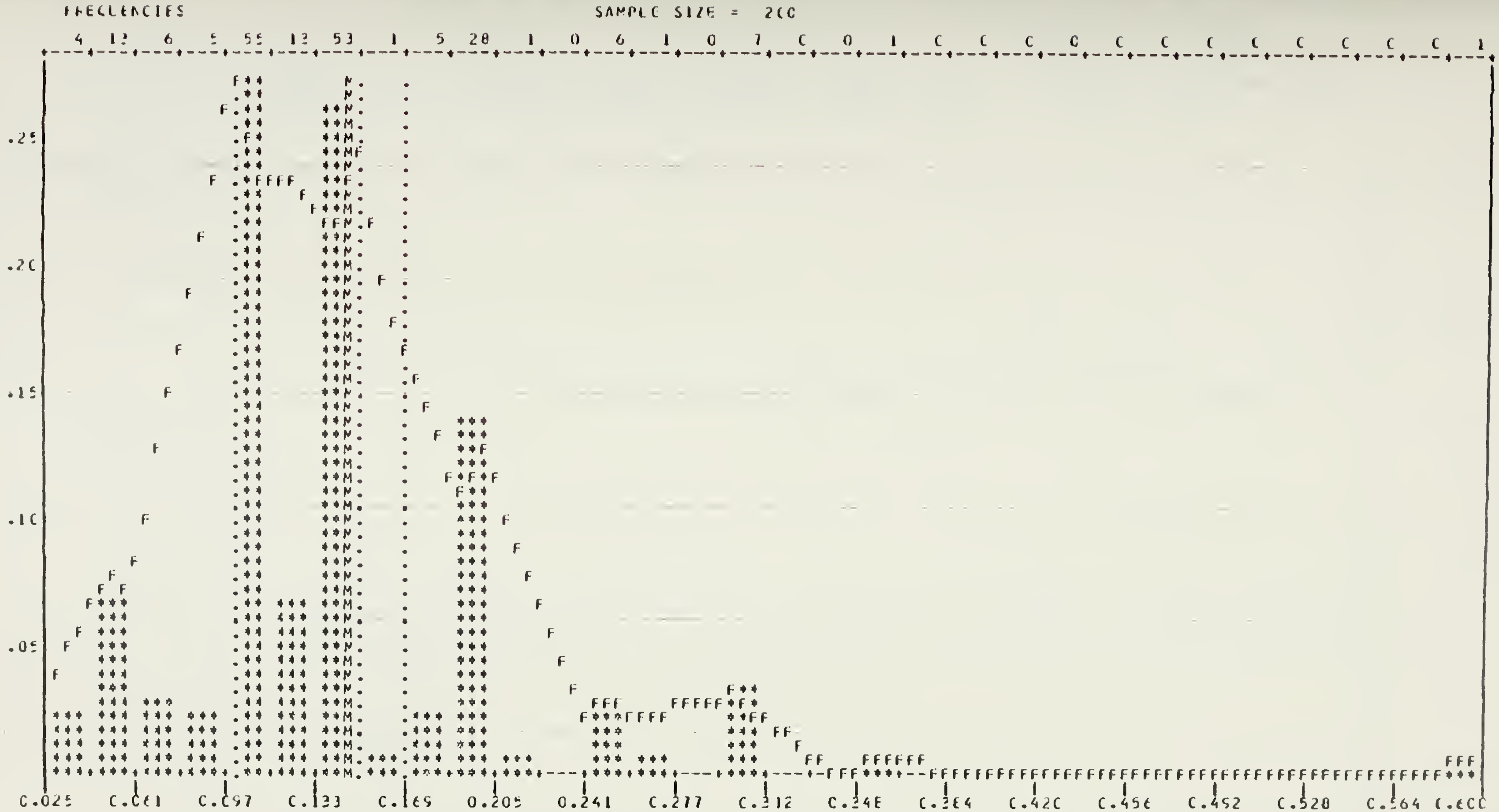
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) TOTAL PILOT HOURS OF RESPONDANT (ACROSS) B2 UPPER LIMIT FOR THRUST-WEIGHT RATIO



STATISTICS..

CORRELATION (R)-	0.00352	R SQUARED -	0.00001	SIGNIFICANCE -	0.48033
STD ERR OF EST -	1812.02754	INTERCEPT (A) -	3522.79796	SLOPE (B) -	12.72518
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.419650E-01	VARIANCE	4.691839E-03	M3	6.536210E-04	MINIMUM	2.500000E-02
MEDIAN	1.500000E-01	STD DEV	6.849700E-02	M4	2.758144E-04	.10 QUANTILE	7.499999E-02
TRIMEAN	1.412500E-01	COEF VAR	4.824923E-01	SKEWNESS	2.033814E 00	.25 QUANTILE (HINGE)	9.999996E-02
MIDMEAN	1.300499E-01	MEAN DEV	4.853500E-02	KURTOSIS	9.529415E 00	.50 QUANTILE (MEDIAN)	1.500000E-01
MIDRANGE	3.124999E-01	RANGE	5.749999E-01	BETA1	6.436458E-04	.75 QUANTILE (HINGE)	1.650000E-01
GEOM MEAN	1.276736E-01	MIDSPREAD	6.500000E-02	BETA2	2.709539E-04	.90 QUANTILE	2.000000E-01
HARM MEAN	1.131678E-01					MAXIMUM	6.000000E-01

WEIGHT GIVEN TO THRUST TO WEIGHT RATIO

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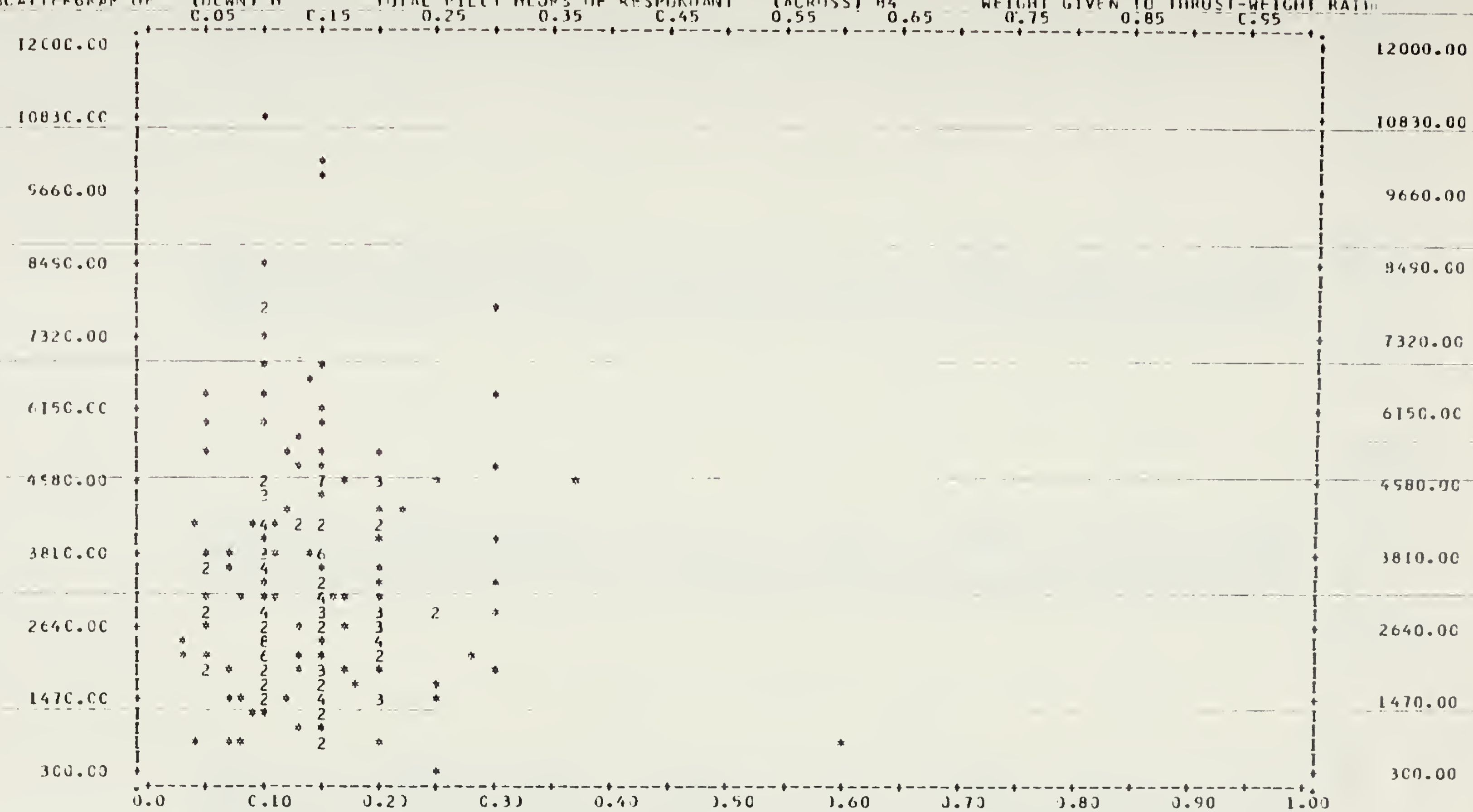
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY

SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) H4 WEIGHT GIVEN TO THRUST-WEIGHT RATIO



STATISTICS..

CORRELATION (R)-	-0.03035	R SQUARED -	0.00092	SIGNIFICANCE -	0.33524
STD ERR OF EST -	1811.23426	INTERCEPT (A) -	3657.62829	SLOPE (B) -	-800.65798
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0

FACTOR: WING LOADING (LBS/SQUARE FOOT)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
1	100.0	100.0	75.0	0.100
2	60.0	53.0	45.0	0.030
3	60.0	50.0	30.0	0.005
4	1.0	3.0	2.0	0.150
5	20.0	15.0	8.0	0.050
6	1.0	3.0	2.0	0.100
7	1.0	3.0	2.0	0.200
8	75.0	60.0	45.0	0.050
9	1.0	3.0	2.0	0.040
10	125.0	120.0	110.0	0.125
11	1.0	3.0	2.0	0.120
12	1.0	3.0	2.0	0.100
13	68.0	60.0	50.0	0.100
14	100.0	80.0	75.0	0.050
15	80.0	60.0	40.0	0.050
16	100.0	94.0	20.0	0.100
17	1.0	3.0	2.0	0.150
18	1.0	3.0	2.0	0.100
19	1.0	3.0	2.0	0.100
20	60.0	48.0	35.0	0.050
21	60.0	50.0	45.0	0.050
22	1.0	3.0	2.0	0.100
23	1.0	3.0	2.0	0.150
24	80.0	70.0	40.0	0.067
25	1.0	3.0	2.0	0.050
26	70.0	65.0	30.0	0.100
27	60.0	50.0	40.0	0.100
28	50.0	49.0	30.0	0.060
29	1.0	3.0	2.0	0.050
30	70.0	68.0	60.0	0.050
31	1.0	3.0	2.0	0.082
32	1.0	3.0	2.0	0.100
33	30.0	23.0	20.0	0.110
34	70.0	60.0	50.0	0.075
35	100.0	99.0	60.0	0.110
36	65.0	55.0	45.0	0.100
37	1.0	3.0	2.0	0.050
38	65.0	45.0	30.0	0.100
39	90.0	60.0	50.0	0.050
40	80.0	60.0	40.0	0.075
41	110.0	75.0	30.0	0.250
42	75.0	60.0	40.0	0.050
43	1.0	3.0	2.0	0.050
44	1.0	3.0	2.0	0.050
45	45.0	35.0	20.0	0.070
46	1.0	3.0	2.0	0.070
47	50.0	40.0	35.0	0.100
48	1.0	3.0	2.0	0.100
49	70.0	60.0	30.0	0.100
50	75.0	65.0	50.0	0.100

FACTOR: WING LOADING (LBS/SQUARE FOOT)

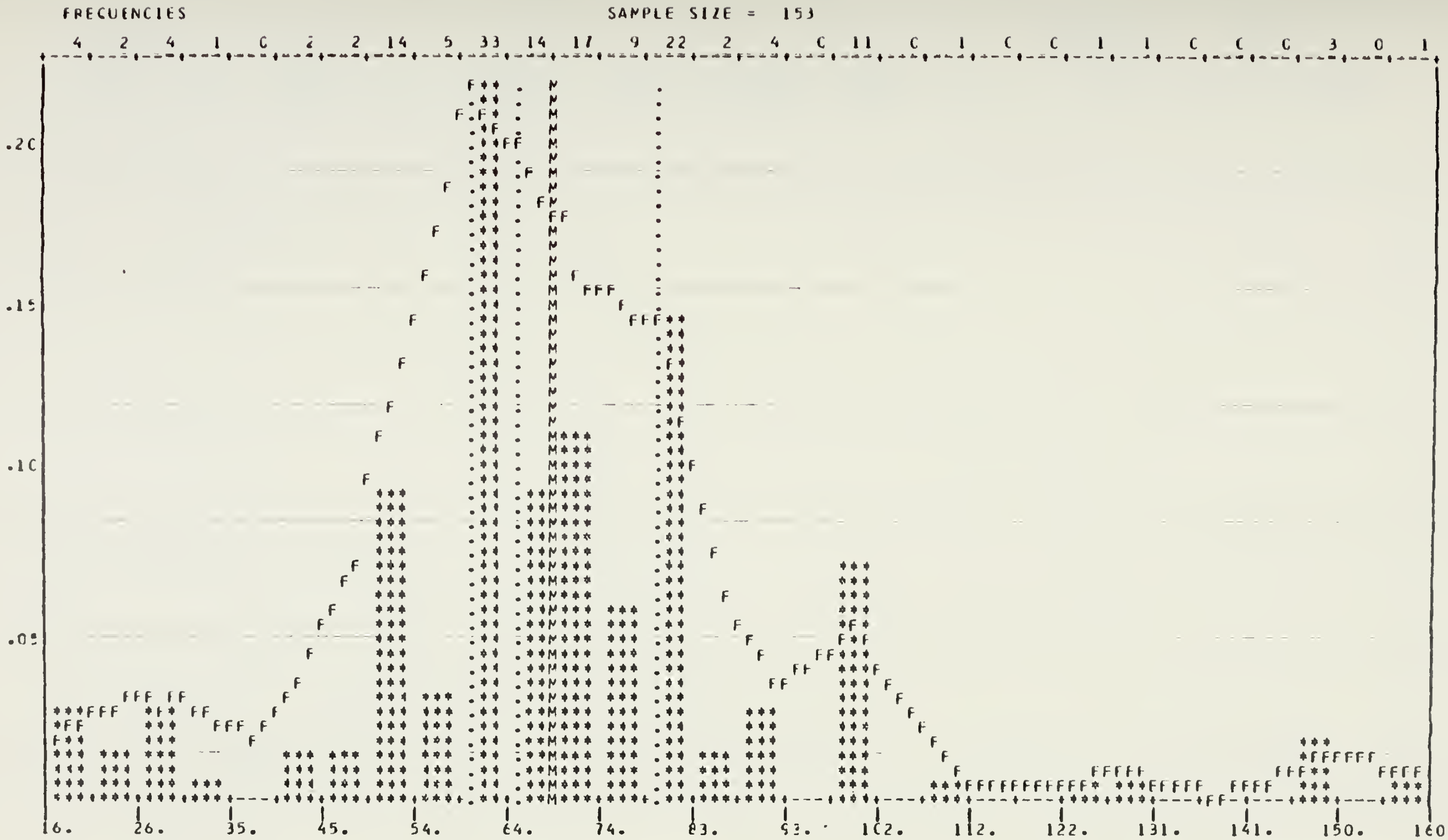
RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
51	1.0	3.0	2.0	0.050
52	45.0	30.0	20.0	0.200
53	60.0	50.0	40.0	0.100
54	85.0	60.0	45.0	0.050
55	90.0	65.0	50.0	0.100
56	90.0	65.0	40.0	0.090
57	60.0	55.0	45.0	0.040
58	60.0	48.0	40.0	0.050
59	150.0	130.0	50.0	0.125
60	70.0	60.0	40.0	0.100
61	80.0	50.0	35.0	0.200
62	1.0	3.0	2.0	0.100
63	1.0	3.0	2.0	0.050
64	70.0	60.0	45.0	0.100
65	80.0	70.0	50.0	0.050
66	40.0	30.0	25.0	0.075
67	25.0	22.0	10.0	0.100
68	100.0	60.0	40.0	0.150
69	150.0	140.0	120.0	0.100
70	1.0	3.0	2.0	0.100
71	100.0	75.0	35.0	0.150
72	1.0	3.0	2.0	0.150
73	60.0	50.0	45.0	0.100
74	65.0	52.0	45.0	0.050
75	60.0	50.0	40.0	0.100
76	1.0	3.0	2.0	0.050
77	70.0	65.0	50.0	0.100
78	1.0	3.0	2.0	0.050
79	65.0	48.0	40.0	0.100
80	60.0	50.0	40.0	0.050
81	80.0	60.0	50.0	0.100
82	150.0	100.0	50.0	0.080
83	1.0	3.0	2.0	0.025
84	70.0	50.0	40.0	0.125
85	50.0	35.0	20.0	0.100
86	70.0	60.0	40.0	0.050
87	60.0	35.0	25.0	0.100
88	100.0	37.0	20.0	0.100
89	68.0	55.0	40.0	0.100
90	1.0	3.0	2.0	0.100
91	80.0	70.0	50.0	0.100
92	1.0	3.0	2.0	0.150
93	80.0	50.0	40.0	0.050
94	1.0	3.0	2.0	0.125
95	65.0	59.0	55.0	0.100
96	60.0	50.0	15.0	0.030
97	60.0	40.0	30.0	0.375
98	30.0	22.0	15.0	0.030
99	50.0	30.0	20.0	0.150
100	90.0	60.0	50.0	0.050

FACTOR: WING LOADING (LBS/SQUARE FOOT)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
101	80.0	65.0	50.0	0.060
102	20.0	11.0	10.0	0.050
103	1.0	3.0	2.0	0.150
104	75.0	65.0	60.0	0.070
105	70.0	65.0	40.0	0.100
106	1.0	3.0	2.0	0.050
107	50.0	41.0	25.0	0.050
108	80.0	65.0	50.0	0.075
109	70.0	55.0	30.0	0.100
110	80.0	50.0	25.0	0.050
111	85.0	70.0	60.0	0.150
112	60.0	45.0	25.0	0.050
113	60.0	50.0	46.0	0.050
114	65.0	55.0	40.0	0.060
115	40.0	35.0	30.0	0.050
116	65.0	55.0	50.0	0.050
117	32.0	17.0	16.0	0.050
118	58.0	54.0	42.0	0.100
119	30.0	25.0	15.0	0.060
120	80.0	70.0	50.0	0.075
121	70.0	45.0	35.0	0.120
122	80.0	50.0	40.0	0.100
123	25.0	15.0	10.0	0.065
124	60.0	50.0	30.0	0.050
125	80.0	60.0	40.0	0.120
126	50.0	45.0	40.0	0.100
127	1.0	3.0	2.0	0.050
128	75.0	60.0	35.0	0.020
129	60.0	55.0	45.0	0.075
130	60.0	57.0	45.0	0.100
131	55.0	45.0	30.0	0.050
132	80.0	65.0	50.0	0.100
133	1.0	3.0	2.0	0.050
134	60.0	40.0	30.0	0.050
135	55.0	50.0	40.0	0.100
136	1.0	3.0	2.0	0.040
137	80.0	70.0	60.0	0.050
138	50.0	37.0	25.0	0.050
139	1.0	3.0	2.0	0.100
140	70.0	55.0	40.0	0.050
141	60.0	55.0	45.0	0.100
142	68.0	60.0	32.0	0.050
143	50.0	35.0	20.0	0.020
144	60.0	55.0	40.0	0.050
145	65.0	60.0	50.0	0.115
146	60.0	45.0	30.0	0.050
147	70.0	65.0	40.0	0.010
148	1.0	3.0	2.0	0.050
149	75.0	70.0	50.0	0.030
150	1.0	3.0	2.0	0.050

FACTOR: WING LOADING (LBS/SQUARE FOOT)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
151	1.0	3.0	2.0	0.050
152	70.0	60.0	50.0	0.080
153	60.0	50.0	40.0	0.050
154	30.0	25.0	20.0	0.100
155	130.0	105.0	95.0	0.100
156	80.0	70.0	50.0	0.065
157	50.0	40.0	20.0	0.040
158	55.0	50.0	40.0	0.120
159	160.0	140.0	110.0	0.100
160	1.0	3.0	2.0	0.010
161	80.0	50.0	40.0	0.100
162	100.0	50.0	30.0	0.050
163	55.0	45.0	35.0	0.075
164	16.0	14.0	12.0	0.100
165	60.0	30.0	50.0	0.050
166	1.0	3.0	2.0	0.100
167	60.0	50.0	41.0	0.075
168	1.0	3.0	2.0	0.250
169	77.0	68.0	48.0	0.050
170	1.0	3.0	2.0	0.100
171	1.0	3.0	2.0	0.080
172	1.0	3.0	2.0	0.100
173	1.0	3.0	2.0	0.100
174	50.0	40.0	30.0	0.200
175	50.0	35.0	25.0	0.025
176	80.0	70.0	50.0	0.050
177	60.0	50.0	30.0	0.100
178	65.0	55.0	45.0	0.100
179	50.0	40.0	30.0	0.100
180	1.0	3.0	2.0	0.100
181	60.0	50.0	45.0	0.100
182	70.0	35.0	20.0	0.095
183	60.0	45.0	30.0	0.050
184	53.0	50.0	42.0	0.010
185	70.0	60.0	50.0	0.070
186	65.0	55.0	50.0	0.150
187	100.0	80.0	60.0	0.150
188	80.0	60.0	50.0	0.100
189	80.0	50.0	40.0	0.100
190	75.0	60.0	50.0	0.100
191	50.0	40.0	35.0	0.150
192	60.0	55.0	50.0	0.100
193	80.0	70.0	60.0	0.050
194	60.0	50.0	35.0	0.050
195	60.0	55.0	50.0	0.100
196	100.0	50.0	20.0	0.050
197	18.0	16.0	15.0	0.100
198	65.0	60.0	50.0	0.010
199	75.0	60.0	45.0	0.100
200	100.0	75.0	50.0	0.100

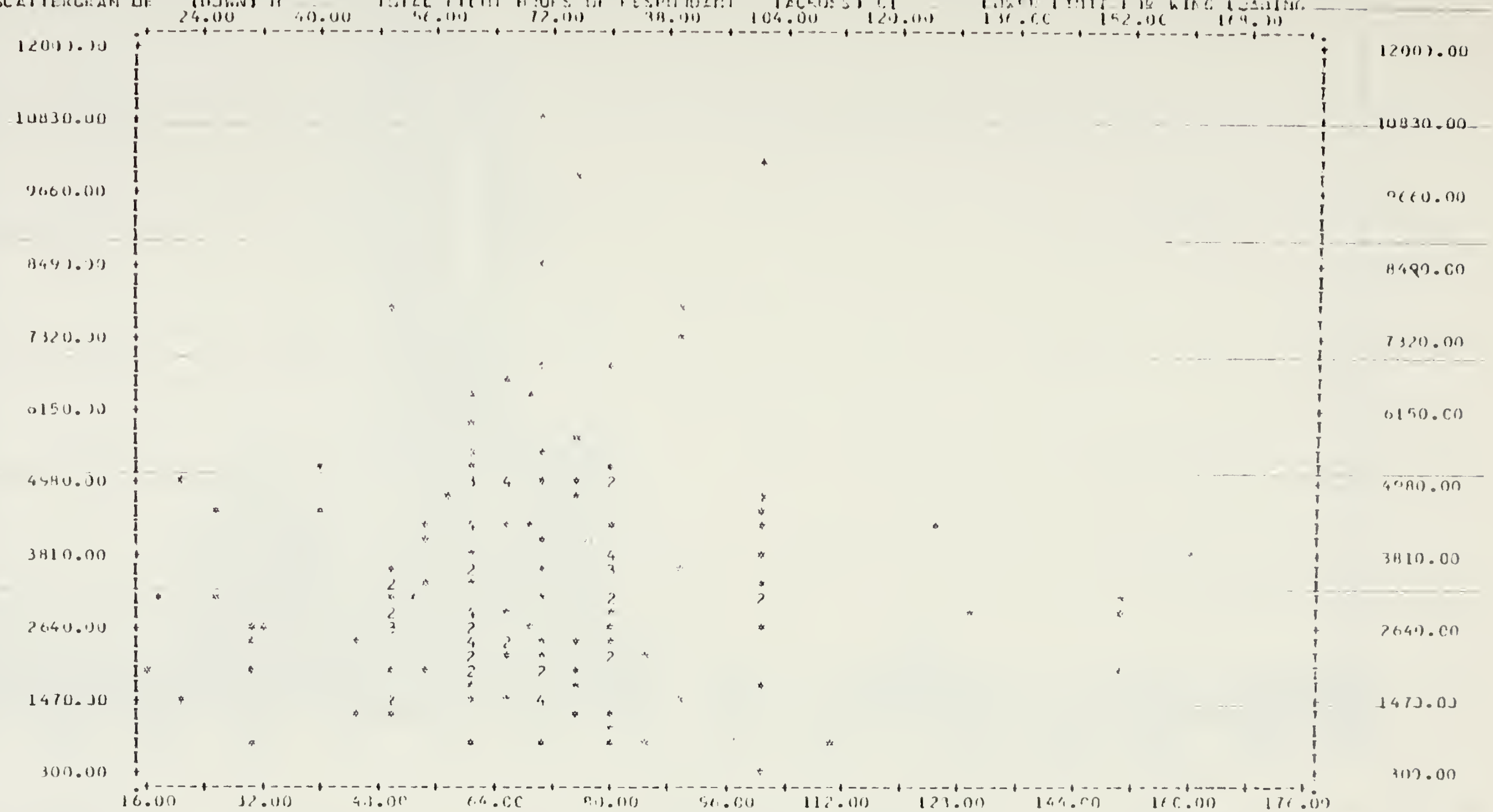


CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	6.5000653E 01	VARIANCE	5.622168E 02	M3	1.360100E 04	MINIMUM	1.600000E 01
MEDIAN	6.5000000E 01	STD DEV	2.371111E 01	M4	1.657507E 06	.10 QUANTILE	4.500000E 01
TRIMEAN	6.7500000E 01	COEF VAR	3.436067E-01	SKEWNESS	1.020270E 00	.25 QUANTILE (HINGE)	6.000000E 01
MIDMEAN	6.7050500E 01	MEAN DEV	1.639868E 01	KURTOSIS	3.003102E 00	.50 QUANTILE (MEDIAN)	6.500000E 01
MIDRANGE	8.8000000E 01	RANGE	1.440000E 02	BETA1	1.233549E 04	.75 QUANTILE (HINGE)	8.000000E 01
GEOM MEAN	6.484515E 01	MIDSPREAD	2.000000E 01	BETA2	1.860175E 06	.90 QUANTILE	1.000000E 02
HARM MEAN	5.566415E 01					MAXIMUM	1.600000E 02

LOWER LIMIT FOR WING LOADING

LT. PATRICK M. O'CONNELL 07/29/77 PAGE 4

FILE ANALYSIS (CREATION DATE = 07/29/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) R1 TOTAL PILOT HOURS OF RESPONDENT (ACROSS) C1 LOWER LIMIT FOR WING LOADING



STATISTICS..

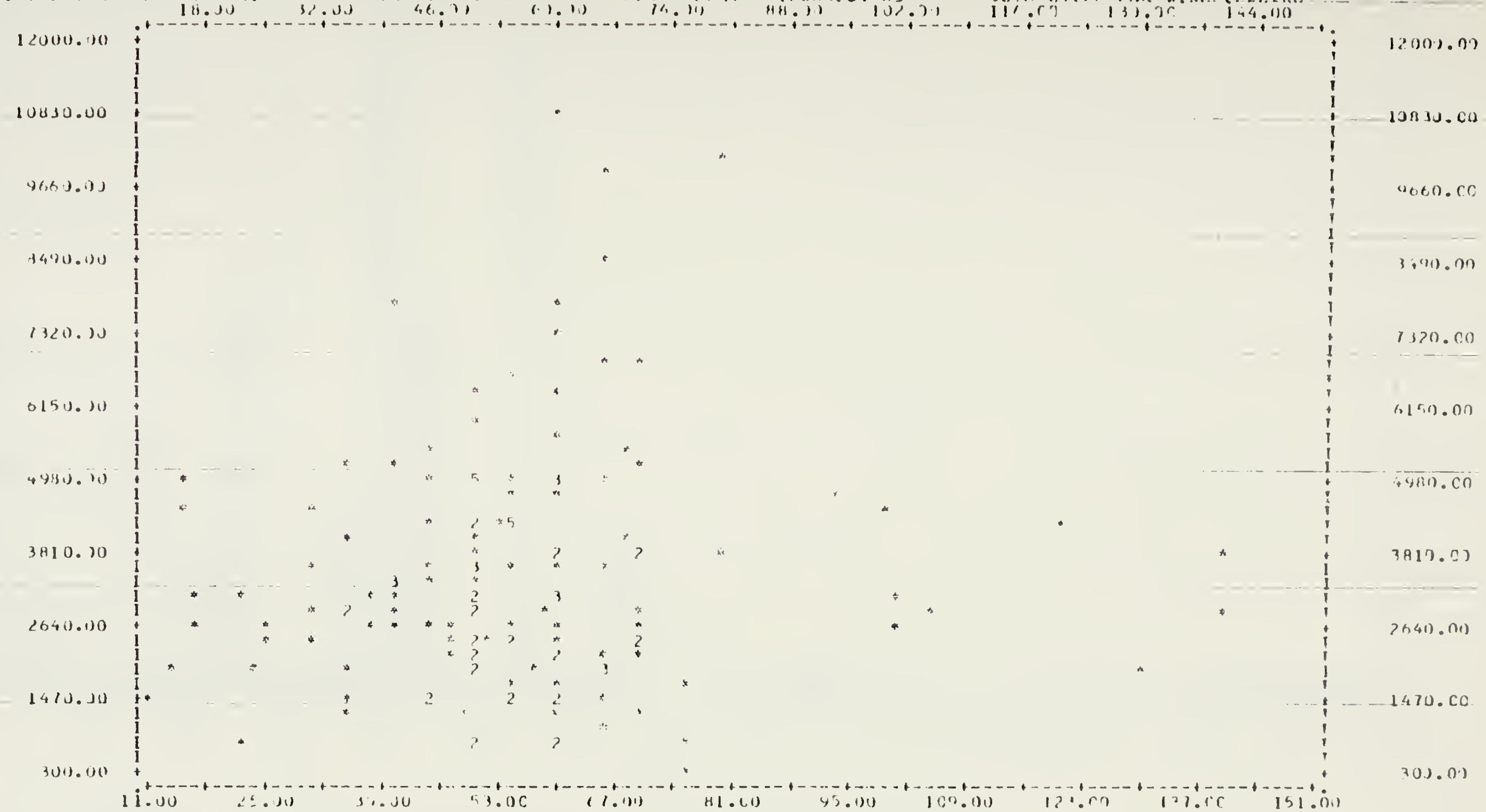
CORRELATION (R) -	0.06369	R SQUARED -	0.00406	SIGNIFICANCE -	0.21792
STD ERR OF EST -	1862.85483	INTERCEPT (A) -	3224.73011	SLOPE (B) -	4.98343
PLOTTED VALUES -	152	EXCLUDED VALUES -	1	MISSING VALUES -	47

CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	5.511183E 01	VARIANCE	4.322055E 02	M3	1.166387E 04	MINIMUM	1.100000E 01
MEDIAN	5.500000E 01	STD DEV	2.078957E 01	M4	1.344505E 06	.10 QUANTILE	3.000000E 01
TRIMEAN	5.375000E 01	COEF VAR	3.772250E-01	SKEWNESS	1.290594E 00	.25 QUANTILE (HINGE)	4.500000E 01
MIDMEAN	5.418420E 01	MEAN DEV	1.303553E 01	KURTOSIS	4.193494E 00	.50 QUANTILE (MEDIAN)	5.500000E 01
MIDRANGE	7.550000E 01	RANGE	1.290000E 02	BETA1	1.143467E 04	.75 QUANTILE (HINGE)	6.000000E 01
GEOM MEAN	5.120235E 01	MIDSPREAD	1.500000E 01	BETA2	1.316426E 06	.90 QUANTILE	7.000000E 01
HARM MEAN	4.650818E 01					MAXIMUM	1.400000E 02

FIFTIETH UTILE FOR WIND LOADING

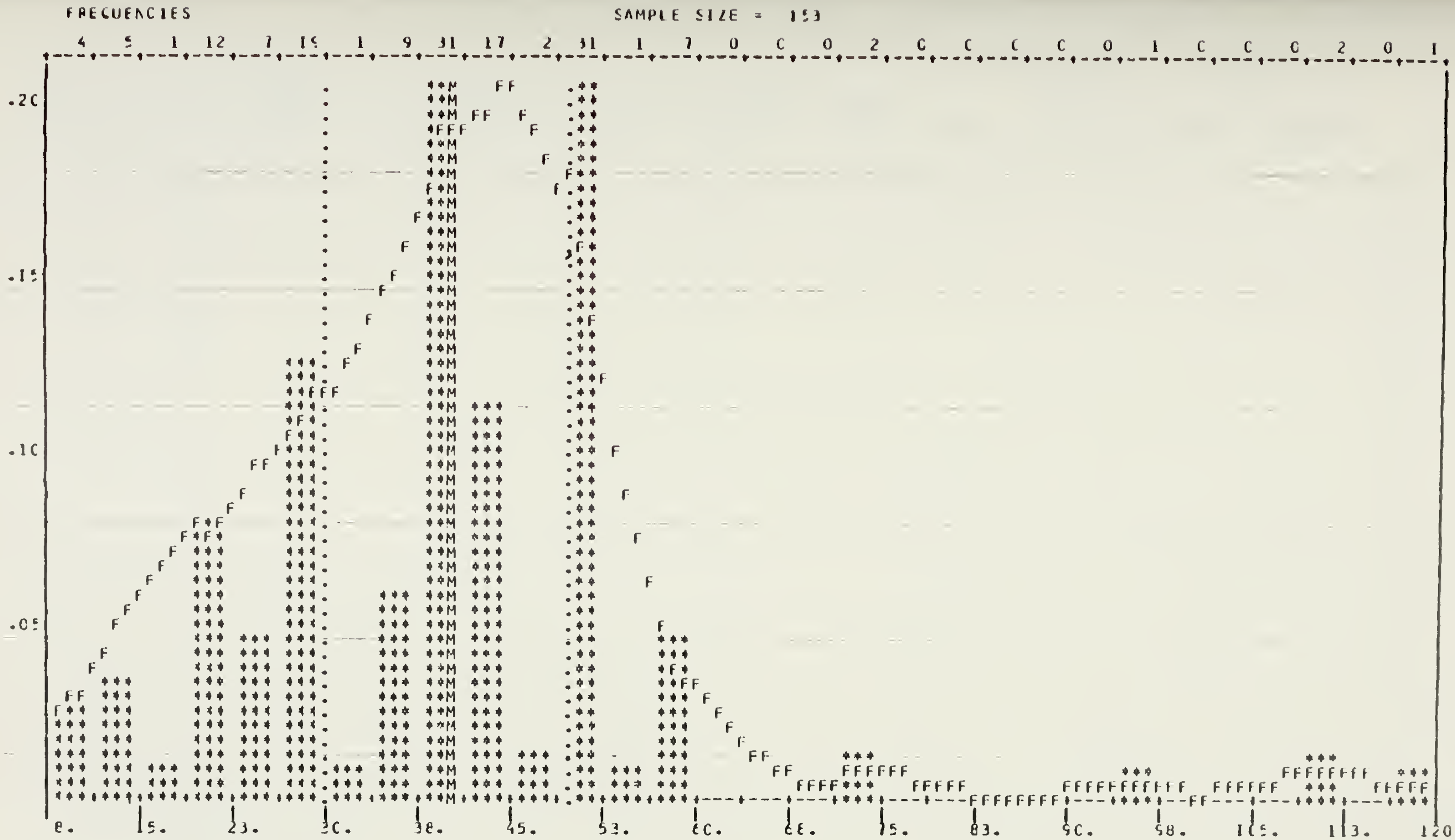
LT. PATRICK N. O'CONNELL 07/29/77 PAGE 9

FILE ANALYSIS (CREATION DATE = 07/29/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) C3 SOTH LITLE FOR WING LEADING



STATISTICS..

CORRELATION (R)-	0.08411	R SQUARED -	0.00708	SIGNIFICANCE -	0.15144
STD ERR OF EST -	1360.62970	INTERCEPT (A) -	3154.06897	SLOPE (B) -	7.52734
PLOTTED VALUES -	152	EXCLUDED VALUES-	1	MISSING VALUES -	47



CENTRAL TENDENCY	
MEAN	4.027451E 01
MEDIAN	4.000000E 01
TRIMEAN	4.000000E 01
MIDMEAN	4.014285E 01
MIDRANGE	6.400000E 01
GEOM MEAN	3.679422E 01
HARM MEAN	3.266255E 01

SPREAD	
VARIANCE	2.922397E 02
STD DEV	1.709502E 01
COEF VAR	4.244624E-01
MEAN DEV	1.154248E 01
RANGE	1.120000E 02
MIDSPREAD	2.000000E 01

HIGHER CENTRAL MOMENTS	
M3	7.694188E 03
M4	7.335158E 05
SKEWNESS	1.540120E 00
KURTOSIS	5.568768E 00
BETA1	7.543984E 03
BETA2	7.176563E 05

DISTRIBUTION	
MINIMUM	8.000000E 00
.10 QUANTILE	2.000000E 01
.25 QUANTILE (HINGE)	3.000000E 01
.50 QUANTILE (MEDIAN)	4.000000E 01
.75 QUANTILE (HINGE)	5.000000E 01
.90 QUANTILE	5.000000E 01
MAXIMUM	1.200000E 02

UPPER LIMIT FOR WING LOADING

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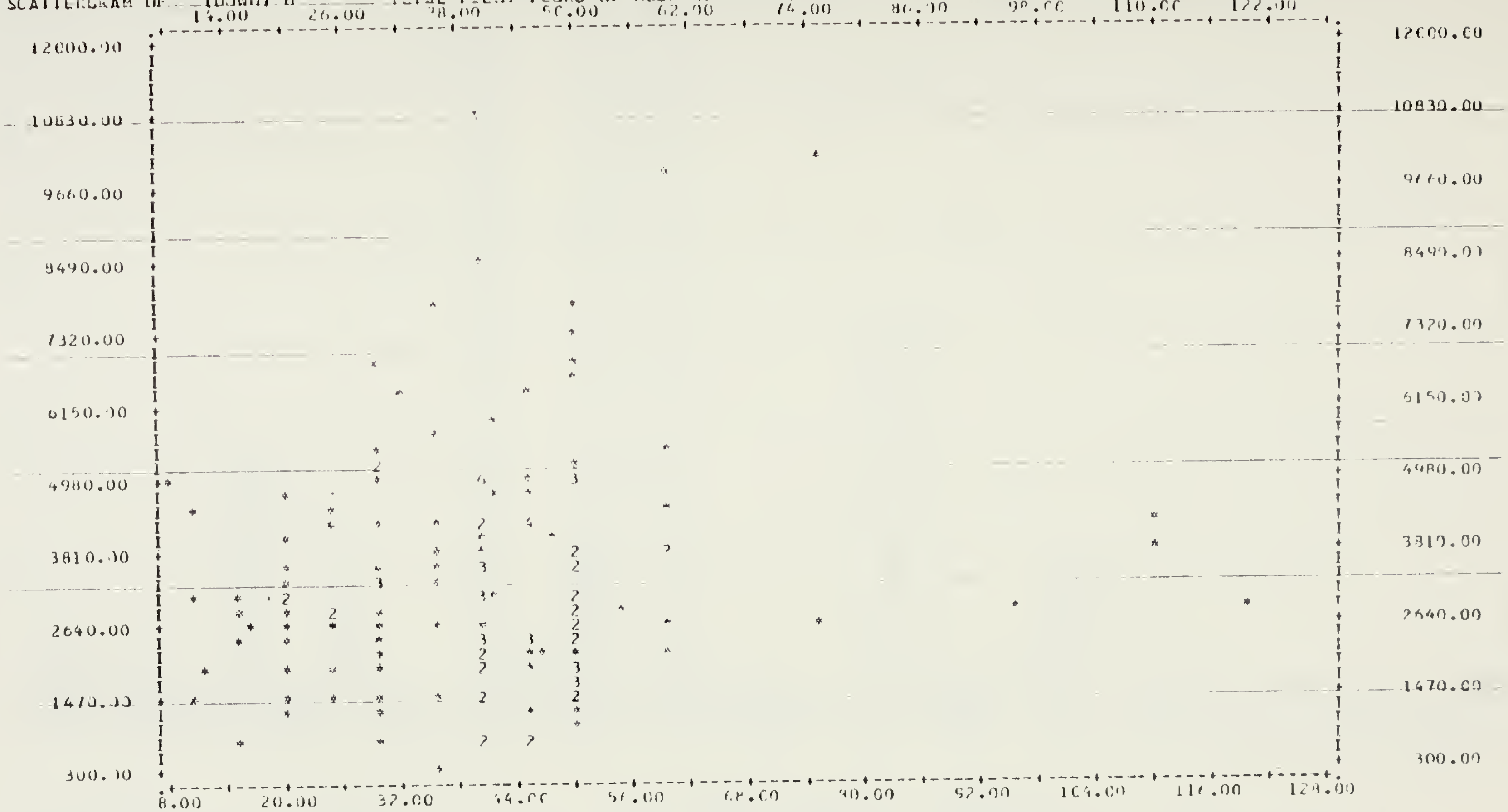
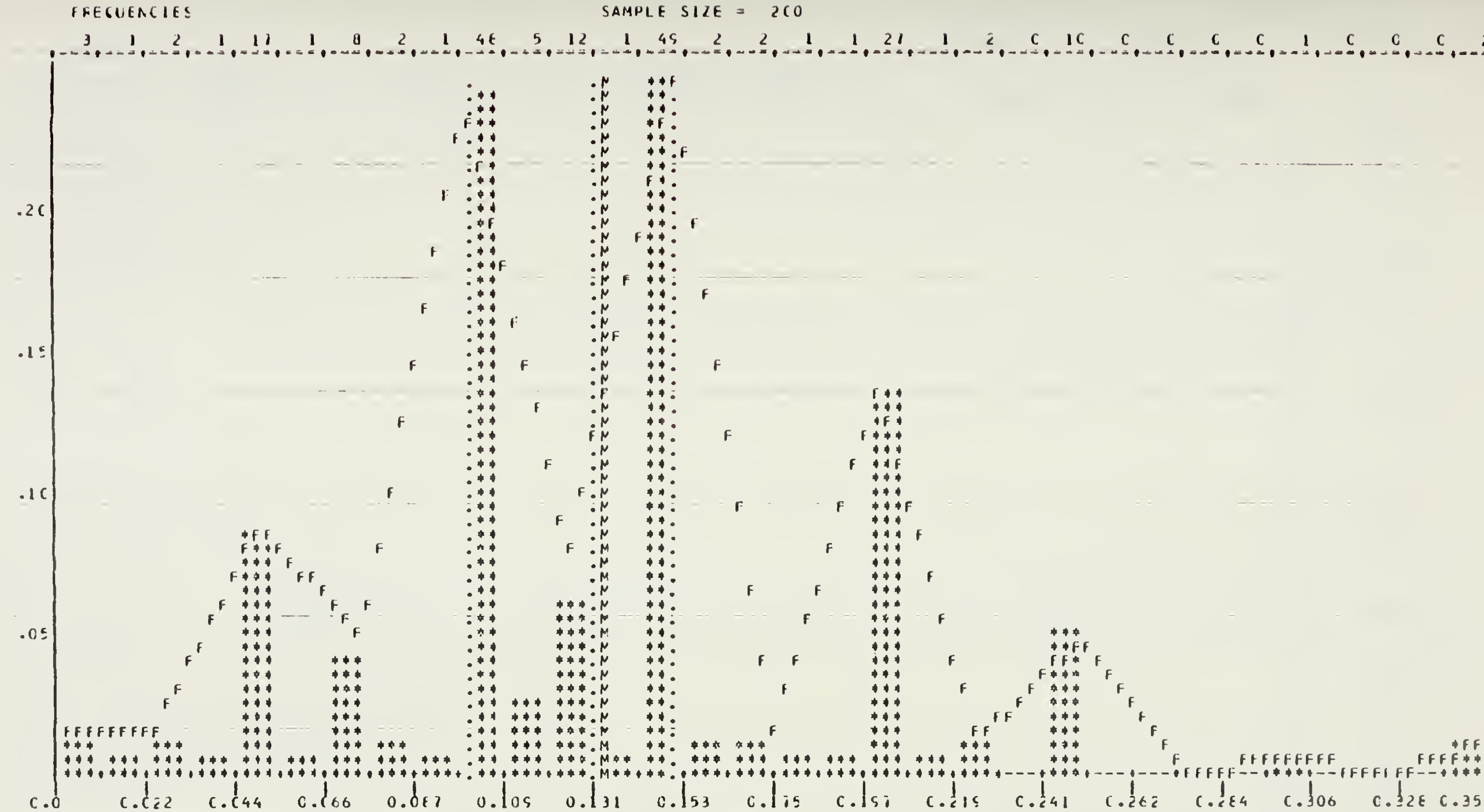
FILE ANALYSIS (CREATION DATE = 07/29/77) OF THE LARGE SAMPLE SURVEY

SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) C2 UPPER LIMIT FOR WING LOADING



STATISTICS..

CORRELATION (R)-	0.13884	R SQUARED -	0.01928	SIGNIFICANCE -	0.04402
STD ERR OF EST -	1648.56626	INTERCEPT (A) -	2960.62822	SLOPE (B) -	15.07820
PLOTTED VALUES -	152	EXCLUDED VALUES-	1	MISSING VALUES -	47

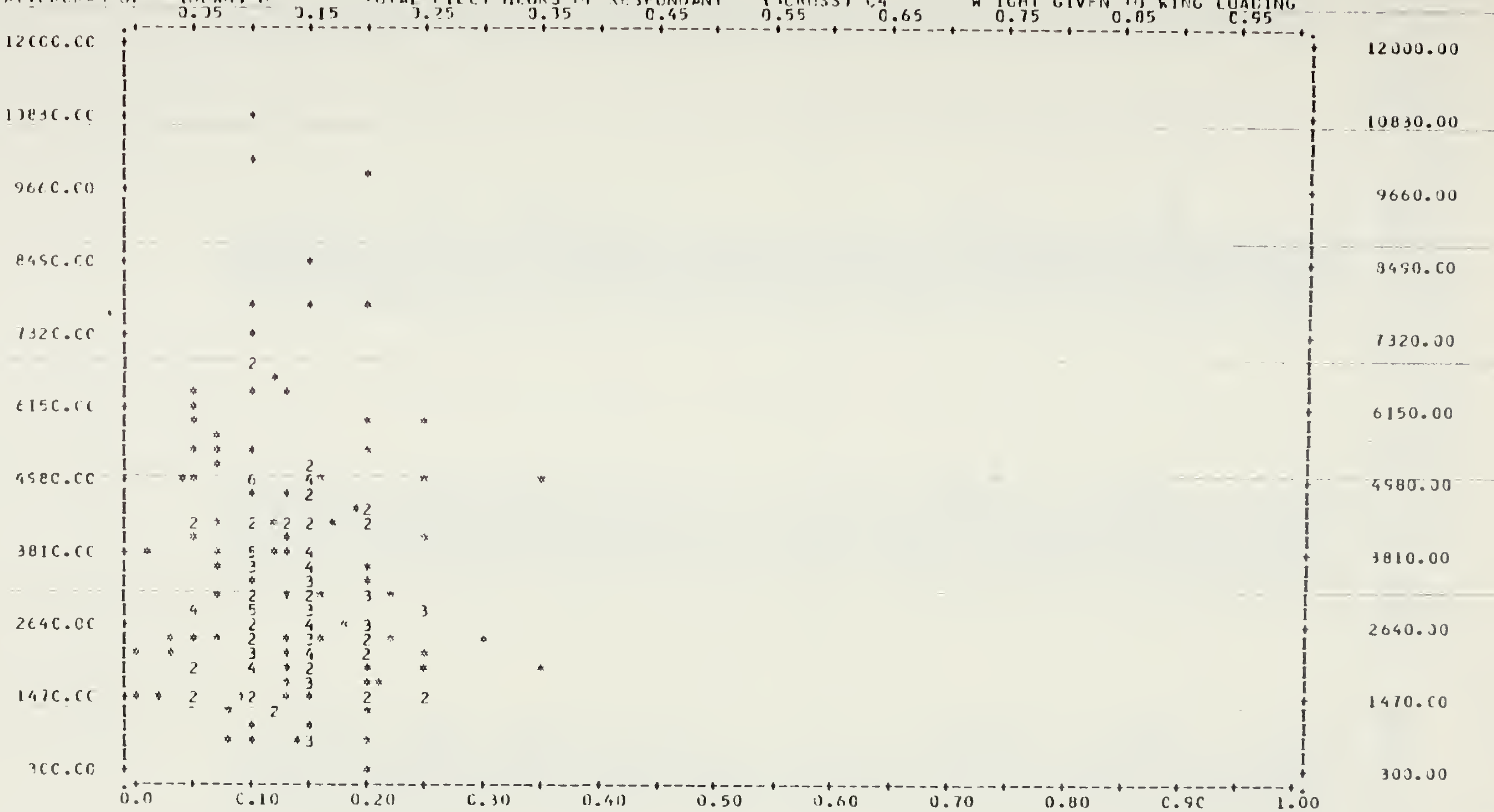


CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.3440500E-01	VARIANCE	3.6760844E-03	M3	1.2151166E-04	MINIMUM	0.0
MEDIAN	1.3000000E-01	STD DEV	6.0636999E-02	M4	5.0809515E-05	.10 QUANTILE	5.0000000E-02
TRIMEAN	1.2749999E-01	COEF VAR	4.5115145E-01	SKEWNESS	5.4503328E-01	.25 QUANTILE (HINGE)	9.9999996E-02
MIDMEAN	1.2854999E-01	MEAN DEV	4.7725000E-02	KURTOSIS	7.5625585E-01	.50 QUANTILE (MEDIAN)	1.3000000E-01
MIDRANGE	1.7500000E-01	RANGE	3.5000000E-01	BETA1	1.1970000E-04	.75 QUANTILE (HINGE)	1.5000000E-01
		MIDSPREAD	5.0000001E-02	BETA2	5.0155515E-05	.90 QUANTILE	2.0000000E-01
						MAXIMUM	3.5000000E-01

WEIGHT GIVEN TO WIND LOADING

. PATRICK M. O'CONNELL 07/26/77 PAGE 26

LE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
ATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) C4 WEIGHT GIVEN TO WING LOADING



ATISTICS..

CORRELATION (R)-	-0.07408	R SQUARED -	0.00549	SIGNIFICANCE -	0.14920
STD ERR OF EST -	1807.05582	INTERCEPT (A) -	3841.11455	SLOPE (B) -	-2207.96855
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0

FACTOR: COMBAT RADIUS (NAUTICLE MILES)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
1	9997.0	9999.0	9998.0	0.050
2	350.0	450.0	650.0	0.050
3	300.0	500.0	1000.0	0.050
4	450.0	500.0	625.0	0.100
5	500.0	650.0	800.0	0.100
6	400.0	450.0	600.0	0.040
7	500.0	600.0	700.0	0.025
8	9997.0	9999.0	9998.0	0.010
9	9997.0	9999.0	9998.0	0.030
10	9997.0	9999.0	9998.0	0.125
11	400.0	550.0	600.0	0.050
12	250.0	300.0	350.0	0.100
13	150.0	200.0	250.0	0.050
14	350.0	400.0	700.0	0.100
15	500.0	600.0	1000.0	0.050
16	9997.0	9999.0	9998.0	0.050
17	9997.0	9999.0	9998.0	0.100
18	9997.0	9999.0	9998.0	0.050
19	150.0	200.0	300.0	0.100
20	90.0	150.0	300.0	0.050
21	400.0	550.0	600.0	0.100
22	300.0	500.0	750.0	0.100
23	300.0	300.0	450.0	0.050
24	400.0	450.0	700.0	0.033
25	300.0	400.0	500.0	0.050
26	150.0	200.0	500.0	0.050
27	400.0	600.0	800.0	0.100
28	500.0	510.0	800.0	0.100
29	300.0	310.0	400.0	0.010
30	375.0	400.0	450.0	0.050
31	400.0	600.0	1000.0	0.090
32	200.0	350.0	500.0	0.050
33	300.0	375.0	700.0	0.090
34	9997.0	9999.0	9998.0	0.075
35	250.0	450.0	600.0	0.090
36	9997.0	9999.0	9998.0	0.050
37	9997.0	9999.0	9998.0	0.035
38	9997.0	9999.0	9998.0	0.050
39	200.0	400.0	600.0	0.020
40	300.0	500.0	800.0	0.100
41	9997.0	9999.0	9998.0	0.083
42	500.0	750.0	1000.0	0.150
43	150.0	200.0	300.0	0.020
44	200.0	500.0	600.0	0.020
45	500.0	600.0	1000.0	0.050
46	200.0	300.0	500.0	0.050
47	9997.0	9999.0	9998.0	0.010
48	50.0	100.0	500.0	0.019
49	250.0	300.0	450.0	0.050
50	250.0	350.0	475.0	0.045

FACTOR: COMBAT RADIUS (NAUTICLE MILES)

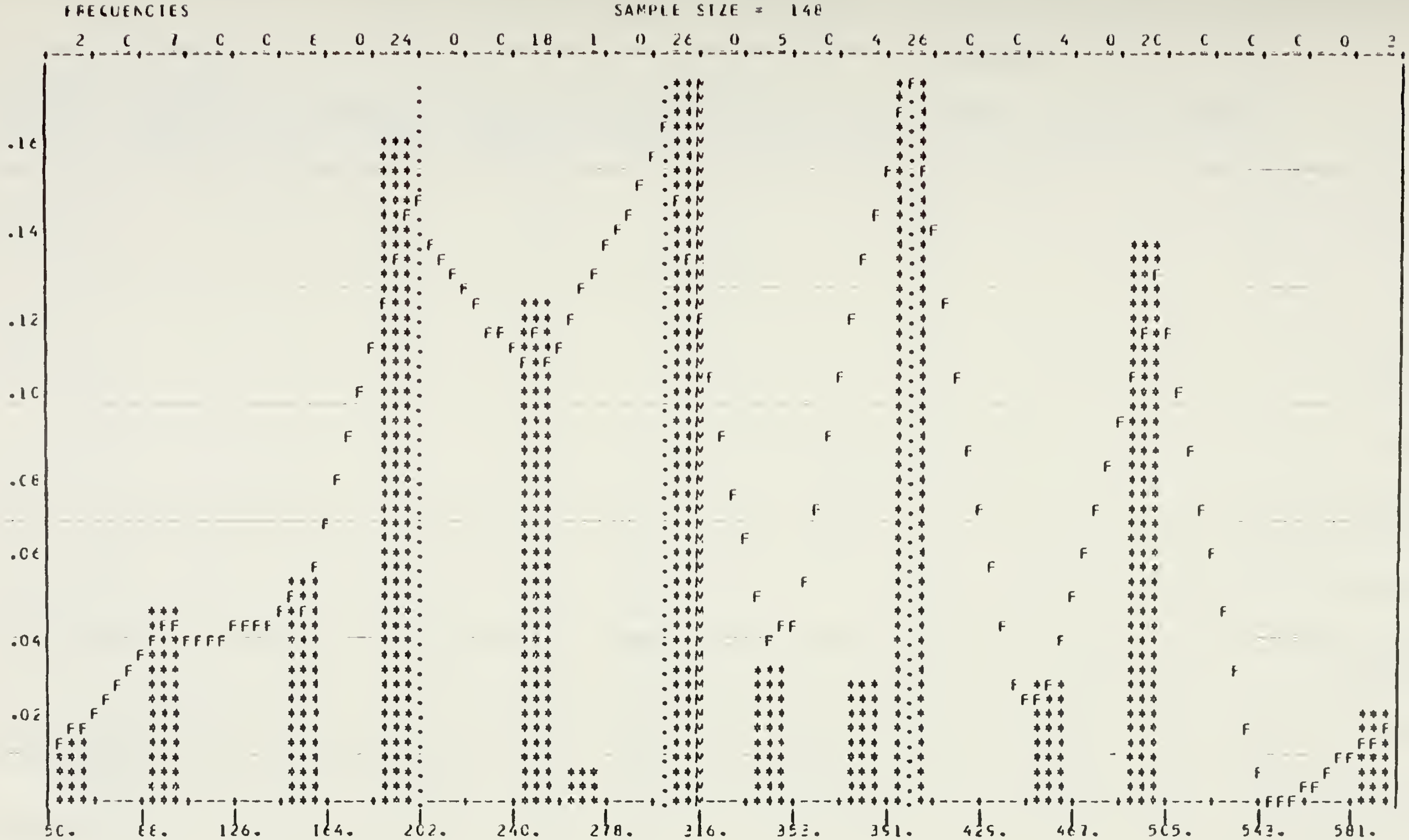
RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
51	500.0	600.0	900.0	0.020
52	9997.0	9999.0	9998.0	0.050
53	9997.0	9999.0	9998.0	0.030
54	250.0	300.0	400.0	0.100
55	200.0	350.0	500.0	0.050
56	200.0	450.0	600.0	0.170
57	300.0	350.0	500.0	0.075
58	350.0	400.0	500.0	0.075
59	200.0	300.0	600.0	0.075
60	600.0	800.0	1000.0	0.075
61	300.0	450.0	700.0	0.050
62	250.0	400.0	500.0	0.100
63	300.0	400.0	500.0	0.050
64	450.0	650.0	850.0	0.050
65	9997.0	9999.0	9998.0	0.150
66	9997.0	9999.0	9998.0	0.075
67	150.0	300.0	500.0	0.050
68	100.0	300.0	1000.0	0.100
69	600.0	900.0	1000.0	0.050
70	9997.0	9999.0	9998.0	0.080
71	9997.0	9999.0	9998.0	0.025
72	9997.0	9999.0	9998.0	0.050
73	9997.0	9999.0	9998.0	0.030
74	9997.0	9999.0	9998.0	0.030
75	150.0	300.0	500.0	0.050
76	400.0	500.0	600.0	0.050
77	250.0	300.0	600.0	0.050
78	500.0	650.0	750.0	0.025
79	200.0	350.0	500.0	0.050
80	9997.0	9999.0	9998.0	0.050
81	400.0	600.0	1000.0	0.020
82	400.0	450.0	500.0	0.020
83	200.0	350.0	500.0	0.100
84	600.0	700.0	800.0	0.150
85	300.0	450.0	600.0	0.100
86	500.0	600.0	1000.0	0.050
87	300.0	400.0	800.0	0.010
88	50.0	250.0	500.0	0.010
89	400.0	600.0	800.0	0.050
90	200.0	350.0	600.0	0.100
91	500.0	600.0	1000.0	0.050
92	250.0	500.0	600.0	0.050
93	100.0	300.0	800.0	0.050
94	200.0	500.0	900.0	0.100
95	500.0	600.0	900.0	0.100
96	300.0	500.0	1000.0	0.060
97	300.0	400.0	600.0	0.060
98	300.0	400.0	600.0	0.020
99	400.0	600.0	750.0	0.050
100	150.0	250.0	350.0	0.025

FACTOR: COMBAT RADIUS (NAUTICLE MILES)

RESPONDANT	LOWER_LIMIT	FIFTIETH_%TILE	UPPER_LIMIT	WEIGHT
101	500.0	700.0	1000.0	0.015
102	400.0	500.0	600.0	0.010
103	9997.0	9999.0	9998.0	0.050
104	100.0	150.0	300.0	0.030
105	200.0	350.0	600.0	0.040
106	400.0	450.0	600.0	0.040
107	500.0	600.0	750.0	0.025
108	500.0	650.0	750.0	0.050
109	200.0	300.0	400.0	0.050
110	400.0	300.0	700.0	0.050
111	380.0	525.0	700.0	0.125
112	250.0	400.0	500.0	0.050
113	500.0	600.0	700.0	0.050
114	300.0	400.0	500.0	0.065
115	100.0	400.0	800.0	0.080
116	400.0	500.0	800.0	0.080
117	9997.0	9999.0	9998.0	0.025
118	300.0	400.0	500.0	0.050
119	100.0	200.0	400.0	0.050
120	300.0	600.0	800.0	0.095
121	400.0	500.0	700.0	0.130
122	400.0	450.0	600.0	0.050
123	250.0	250.0	500.0	0.080
124	400.0	500.0	750.0	0.100
125	200.0	400.0	600.0	0.080
126	9997.0	9999.0	9998.0	0.050
127	250.0	350.0	450.0	0.030
128	300.0	400.0	600.0	0.030
129	150.0	200.0	300.0	0.030
130	250.0	500.0	1000.0	0.050
131	9997.0	9999.0	9998.0	0.100
132	9997.0	9999.0	9998.0	0.050
133	400.0	600.0	1000.0	0.050
134	9997.0	9999.0	9998.0	0.010
135	350.0	400.0	550.0	0.100
136	200.0	500.0	800.0	0.050
137	9997.0	9999.0	9998.0	0.050
138	450.0	685.0	900.0	0.050
139	300.0	350.0	500.0	0.050
140	300.0	500.0	700.0	0.025
141	200.0	600.0	400.0	0.050
142	9997.0	9999.0	9998.0	0.025
143	400.0	600.0	800.0	0.010
144	200.0	500.0	700.0	0.075
145	9997.0	9999.0	9998.0	0.040
146	500.0	600.0	750.0	0.050
147	9997.0	9999.0	9998.0	0.050
148	9997.0	9999.0	9998.0	0.050
149	9997.0	9999.0	9998.0	0.010
150	250.0	300.0	500.0	0.050

FACTOR: COMBAT RADIUS (NAUTICLE MILES)

RESPONDENT	LOWER_LIMIT	FIFTIETH_QTILE	UPPER_LIMIT	WEIGHT
151	300.0	400.0	500.0	0.010
152	9997.0	9999.0	9998.0	0.100
153	9997.0	9999.0	9998.0	0.100
154	300.0	350.0	500.0	0.100
155	9997.0	9999.0	9998.0	0.050
156	300.0	400.0	700.0	0.060
157	200.0	300.0	400.0	0.030
158	450.0	750.0	950.0	0.020
159	400.0	600.0	800.0	0.040
160	9997.0	9999.0	9998.0	0.010
161	9997.0	9999.0	9998.0	0.050
162	500.0	700.0	800.0	0.160
163	375.0	430.0	600.0	0.090
164	250.0	450.0	600.0	0.050
165	9997.0	9999.0	9998.0	0.050
166	500.0	600.0	750.0	0.100
167	350.0	700.0	1000.0	0.100
168	9997.0	9999.0	9998.0	0.050
169	200.0	400.0	500.0	0.050
170	500.0	700.0	750.0	0.025
171	200.0	800.0	400.0	0.095
172	500.0	600.0	750.0	0.025
173	9997.0	9999.0	9998.0	0.060
174	400.0	800.0	1000.0	0.050
175	100.0	200.0	250.0	0.050
176	250.0	300.0	900.0	0.040
177	250.0	400.0	500.0	0.050
178	300.0	400.0	600.0	0.010
179	375.0	520.0	700.0	0.070
180	9997.0	9999.0	9998.0	0.050
181	9997.0	9999.0	9998.0	0.150
182	200.0	400.0	600.0	0.100
183	250.0	450.0	600.0	0.100
184	275.0	350.0	375.0	0.010
185	200.0	350.0	450.0	0.070
186	400.0	450.0	800.0	0.090
187	9997.0	9999.0	9998.0	0.050
188	9997.0	9999.0	9998.0	0.100
189	300.0	500.0	600.0	0.050
190	9997.0	9999.0	9998.0	0.100
191	9997.0	9999.0	9998.0	0.025
192	400.0	500.0	750.0	0.050
193	200.0	400.0	600.0	0.150
194	9997.0	9999.0	9998.0	0.050
195	250.0	300.0	500.0	0.050
196	400.0	500.0	750.0	0.100
197	9997.0	9999.0	9998.0	0.020
198	400.0	450.0	600.0	0.020
199	9997.0	9999.0	9998.0	0.030
200	200.0	300.0	500.0	0.050



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	3.150000E 02	VARIANCE	1.562721E 04	M3	2.566857E 05	MINIMUM	5.000000E 01
MEDIAN	3.000000E 02	STD DEV	1.250088E 02	M4	5.570653E 08	.10 QUANTILE	1.500000E 02
TRIMEAN	3.000000E 02	COEF VAR	3.968534E-01	SKEWNESS	1.314997E-01	.25 QUANTILE (HINGE)	2.000000E 02
MIDMEAN	3.112161E 02	MEAN DEV	1.019595E 02	KURTOSIS	-7.188852E-01	.50 QUANTILE (MEDIAN)	3.000000E 02
MIDRANGE	3.250000E 02	RANGE	5.500000E 02	BETA1	2.510061E 05	.75 QUANTILE (HINGE)	4.000000E 02
GEOM MEAN	2.862373E 02	MIDSPREAD	2.000000E 02	BETA2	5.518136E 08	.90 QUANTILE	5.000000E 02
HARM MEAN	2.506123E 02					MAXIMUM	6.000000E 02

LOWER LIMIT FOR COMBAT FAILS

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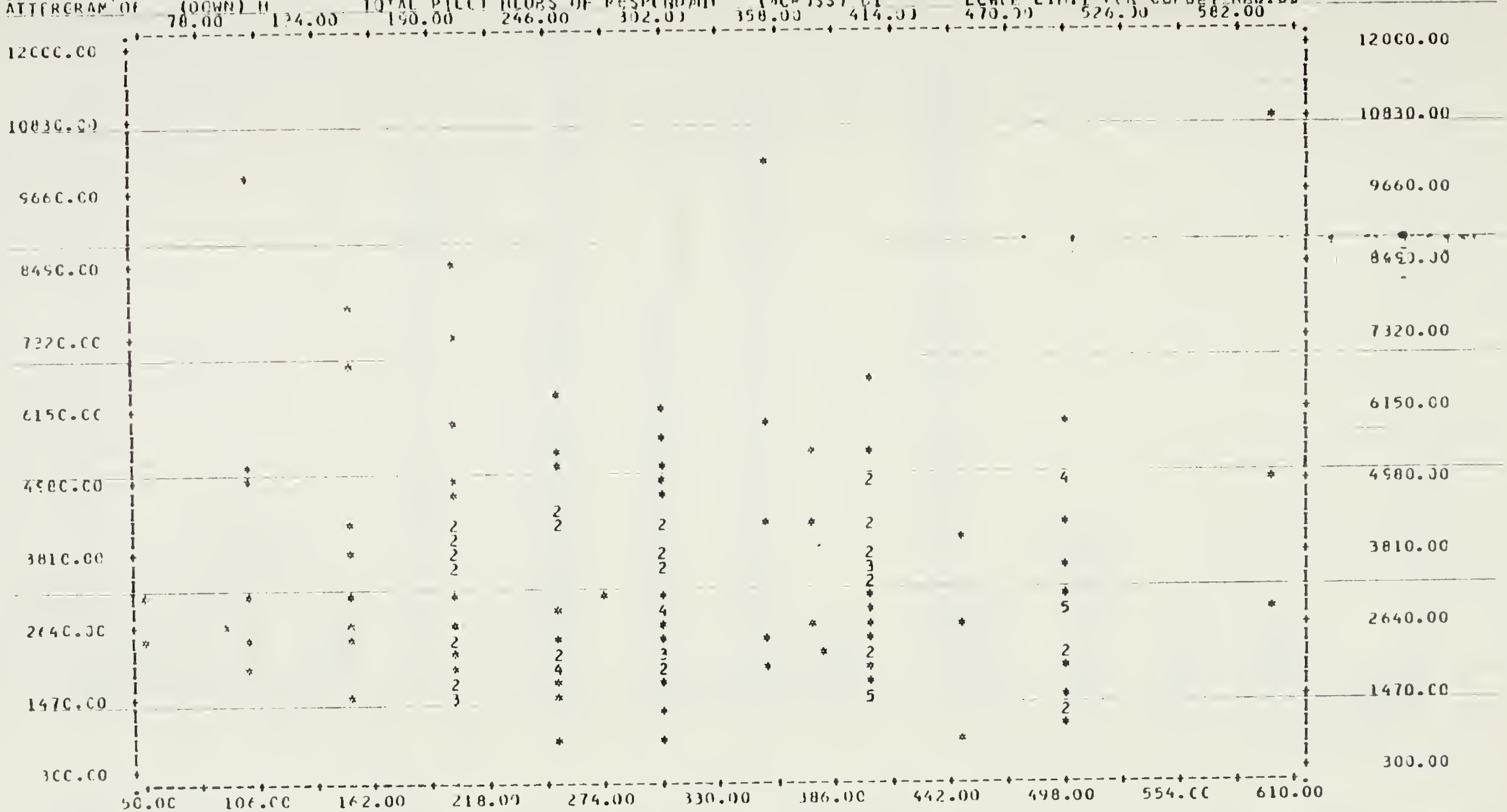
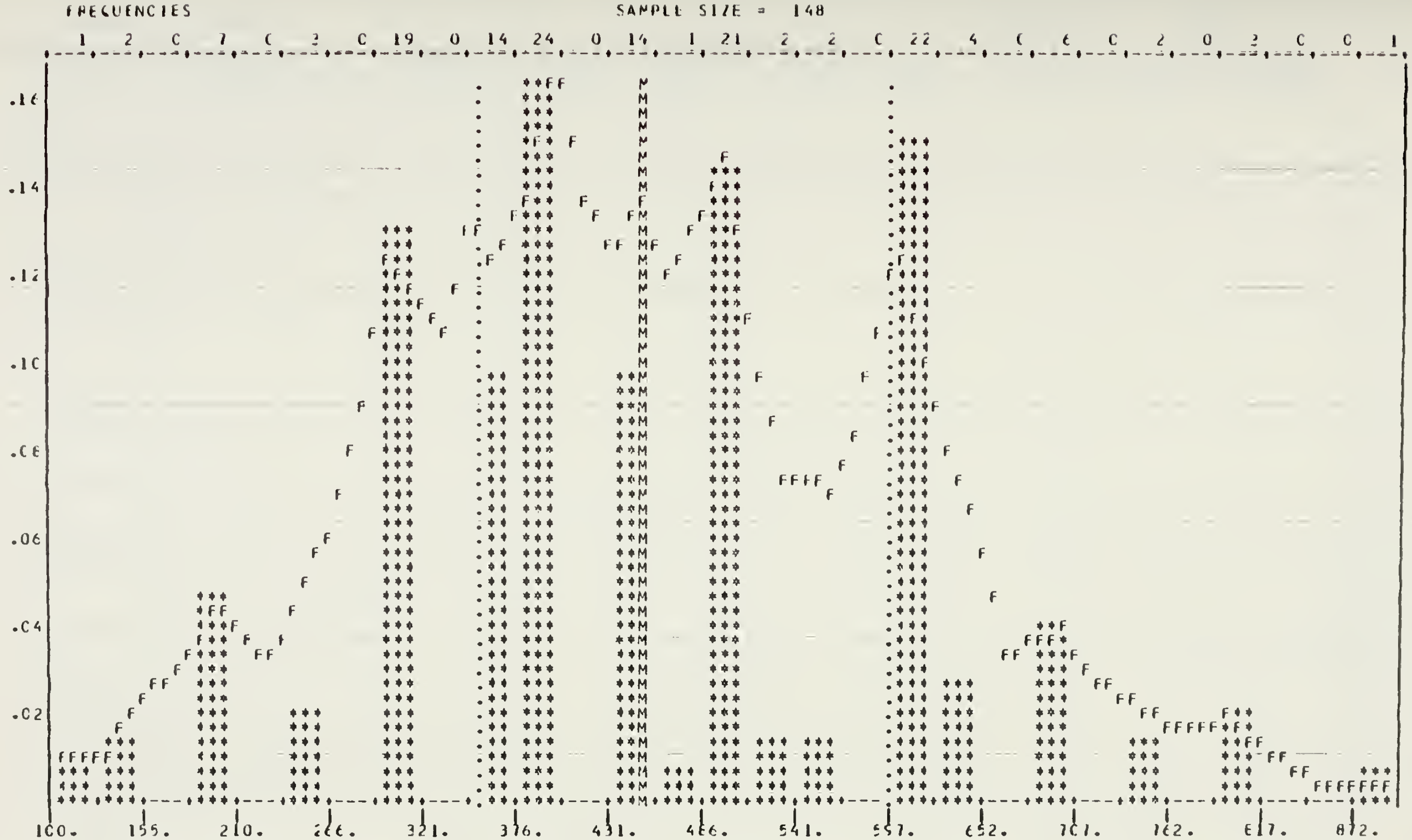
LE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY

ATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) 01 LOWER LIMIT FOR COMBAT RADIUS



ATISTICS..

CORRELATION (R)-	-0.03404	R SQUARED -	0.00116	SIGNIFICANCE -	0.34115
STD ERR OF EST -	1825.93170	INTERCEPT (A) -	3714.63570	SLOPE (B) -	-0.49639
PLOTTED VALUES -	147	EXCLUDED VALUES-	1	MISSING VALUES -	52



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	4.527363E 02	VARIANCE	2.269977E 04	M3	9.586726E 05	MINIMUM	1.000000E 02
MEDIAN	4.500000E 02	STD DEV	1.506644E 02	M4	1.474540E 09	.10 QUANTILE	3.000000E 02
TRIMEAN	4.625000E 02	COEF VAR	3.327862E-01	SKEWNESS	2.803682E-01	.25 QUANTILE (HINGE)	3.500000E 02
MIDMEAN	4.433782E 02	MEAN DEV	1.205067E 02	KURTOSIS	-1.383686E-01	.50 QUANTILE (MEDIAN)	4.500000E 02
MIDRANGE	5.000000E 02	RANGE	8.000000E 02	BETA1	9.395236E 05	.75 QUANTILE (HINGE)	6.000000E 02
GEOM MEAN	4.256641E 02	MIDSPREAD	2.500000E 02	BETA2	1.455367E 09	.90 QUANTILE	6.500000E 02
HARM MEAN	3.947307E 02					MAXIMUM	9.000000E 02

FIFTIETH UTILE FOR CEMENT FACIES

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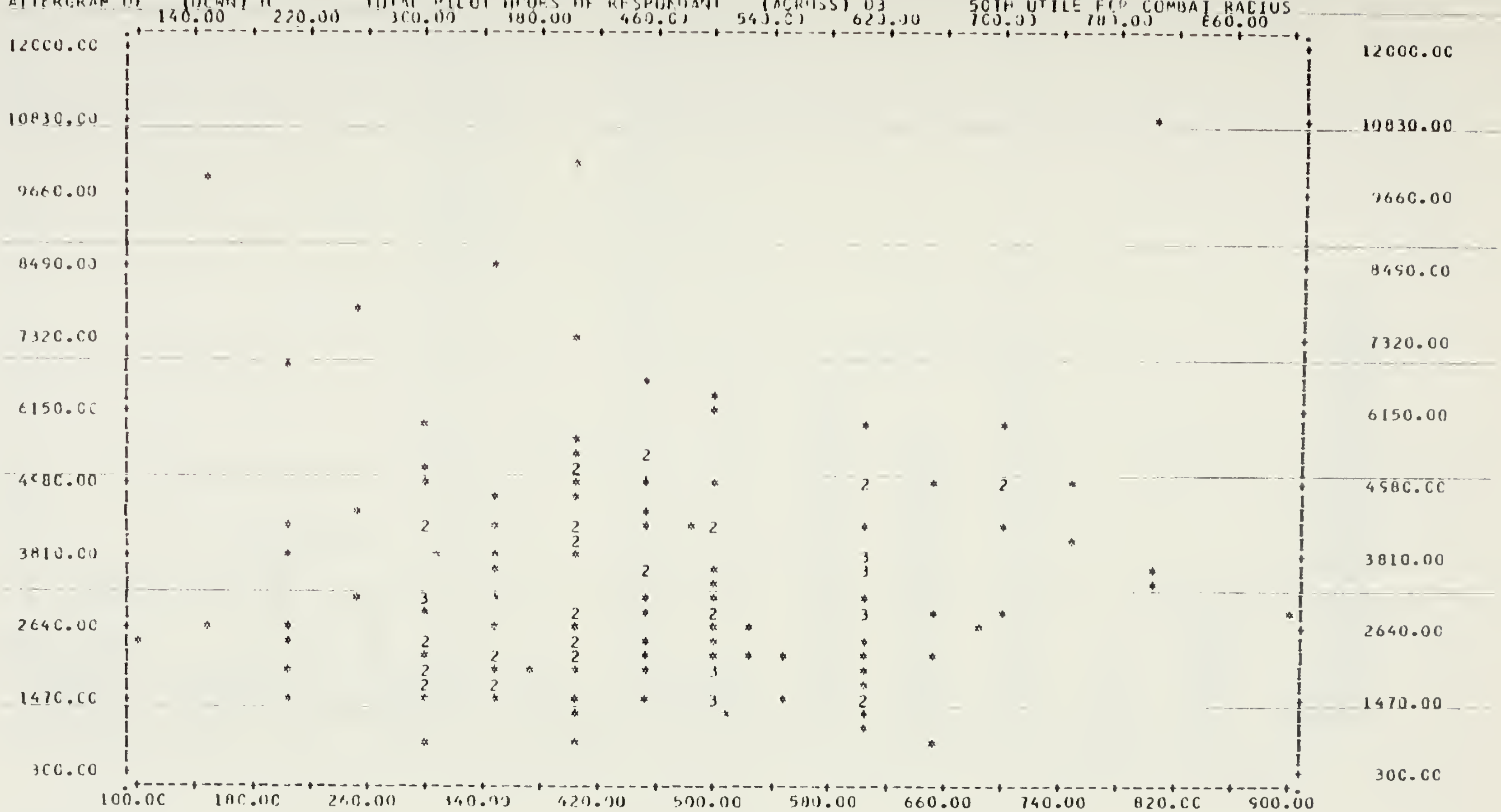
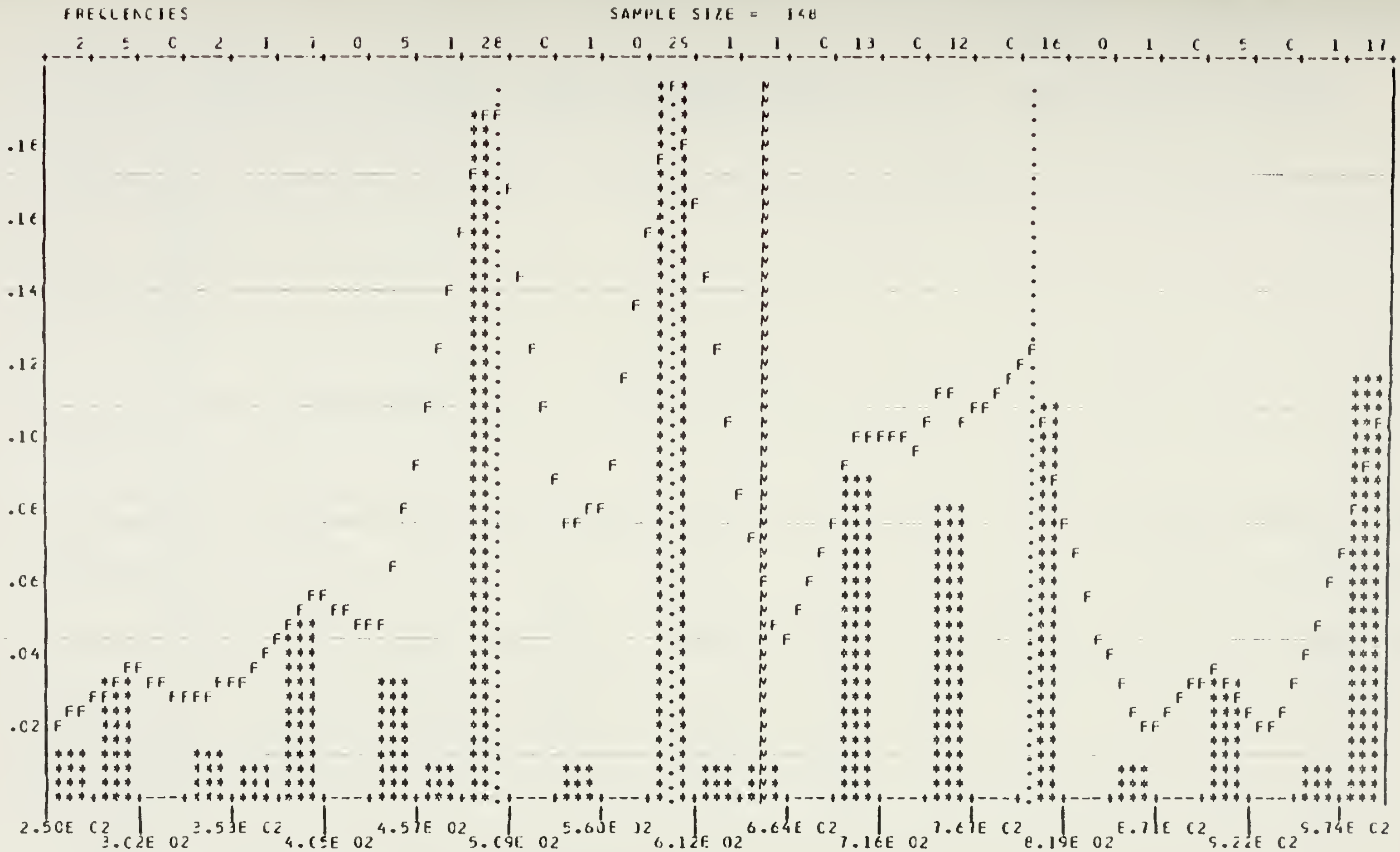
LF ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
ATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) 03 50TH UTILE FOR COMBAT RADIUS



TATISTICS..

CORRELATION (R)-	0.01155	R SQUARED -	0.00013	SIGNIFICANCE -	0.44479
STD ERR OF EST -	1826.86868	INTERCEPT (A) -	3455.07559	SLOPE (B) -	0.13914
PLOTTED VALUES -	147	EXCLUDED VALUES-	1	MISSING VALUES -	52



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	6.488174E 02	VARIANCE	3.814059E 04	M3	1.782383E 06	MINIMUM	2.5000000E 02
MEDIAN	6.0000000E 02	STD DEV	1.952962E 02	M4	3.369047E 09	.10 QUANTILE	4.0000000E 02
TRIMEAN	6.2500000E 02	COEF VAR	3.010032E-01	SKEWNESS	2.392875E-01	.25 QUANTILE (HINGE)	5.0000000E 02
MIDMEAN	6.314167E 02	MEAN DEV	1.576013E 02	KURTOSIS	-6.840334E-01	.50 QUANTILE (MEDIAN)	6.0000000E 02
MIDRANGE	6.2500000E 02	RANGE	7.5000000E 02	BETA1	1.746416E 06	.75 QUANTILE (HINGE)	8.0000000E 02
GEOM MEAN	6.183464E 02	MIDSPREAD	3.0000000E 02	BETA2	3.336370E 09	.90 QUANTILE	1.0000000E 03
HARM MEAN	5.863474E 02					MAXIMUM	1.0000000E 03

UPPER LIMIT FOR COMBAT RADIUS

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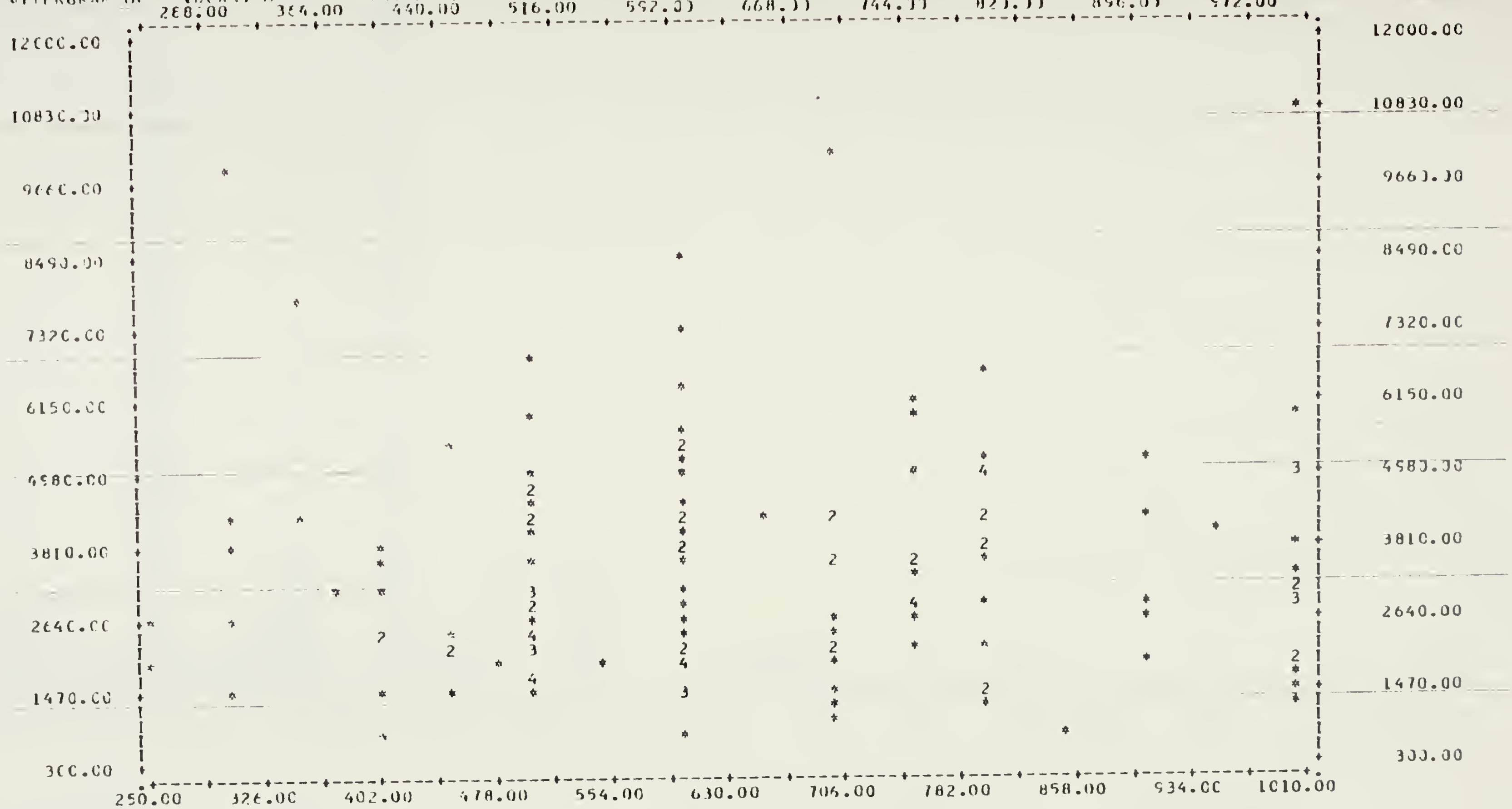
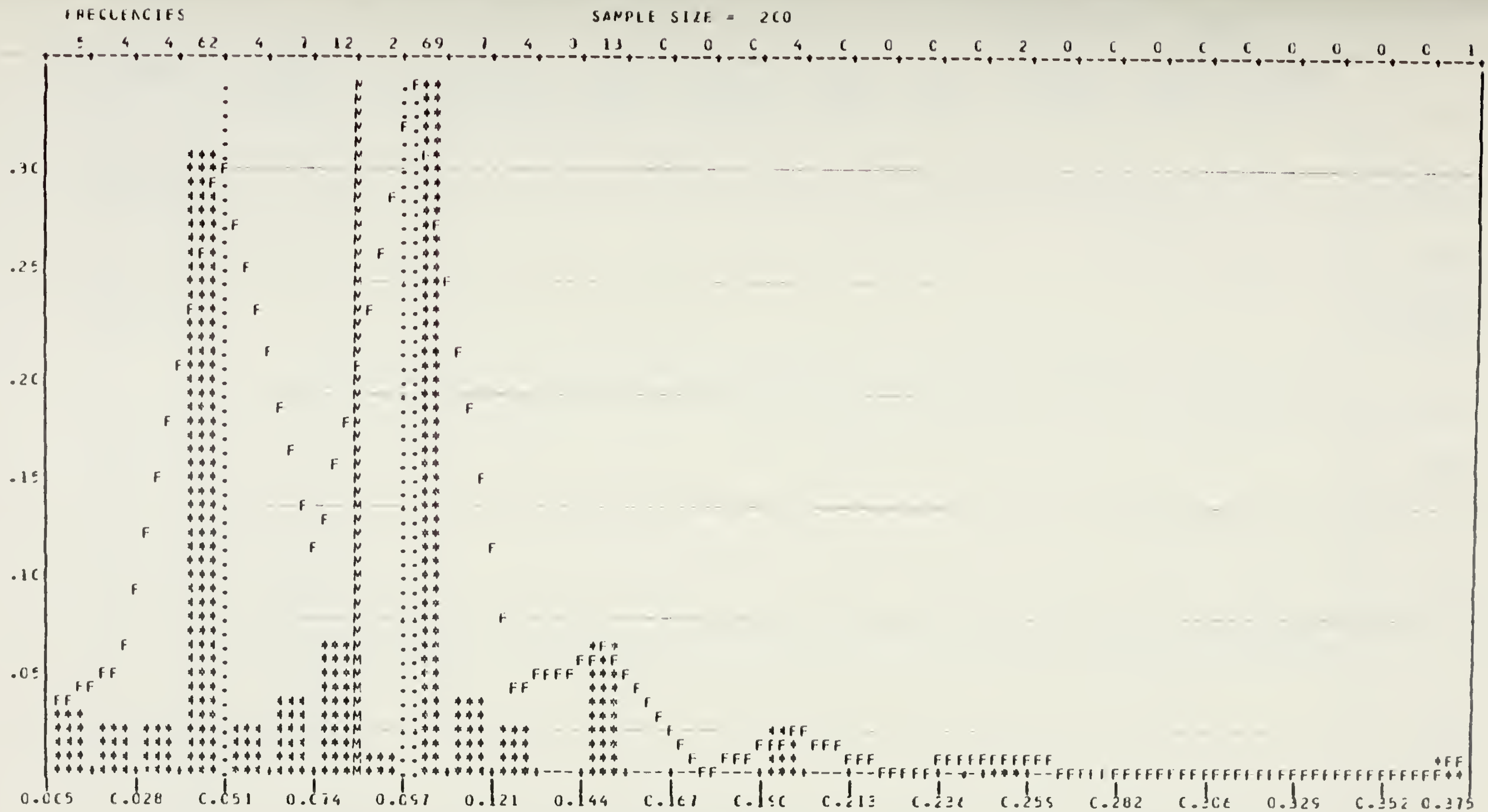
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) 02 UPPER LIMIT FOR COMBAT RADIUS



STATISTICS..

CORRELATION (R)-	0.05020	R SQUARED -	0.00252	SIGNIFICANCE -	0.27285
STD ERR OF EST -	1824.68399	INTERCEPT (A) -	3255.91448	SLOPE (B) -	0.46675
PLOTTED VALUES -	147	EXCLUDED VALUES-	1	MISSING VALUES -	52



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	8.489496E-02	VARIANCE	2.093812E-03	M3	1.881643E-04	MINIMUM	4.999999E-03
MEDIAN	9.749997E-02	STD DEV	4.575884E-02	M4	5.035251E-05	.10 QUANTILE	5.000000E-02
TRIMEAN	8.624995E-02	COEF VAR	5.390054E-01	SKEWNESS	1.964076E 00	.25 QUANTILE (HINGE)	4.999998E-02
MIDMEAN	8.073997E-02	MEAN DEV	3.359456E-02	KURTOSIS	8.484735E 00	.50 QUANTILE (MEDIAN)	9.749997E-02
MIDRANGE	1.900000E-01	RANGE	3.699999E-01	BETA1	1.653710E-04	.75 QUANTILE (HINGE)	9.999996E-02
GEOM MEAN	7.342219E-02	MIDSPREAD	4.999998E-02	BETA2	4.947603E-05	.90 QUANTILE	1.250000E-01
HARM MEAN	5.847301E-02					MAXIMUM	3.750000E-01

WEIGHT GIVEN TO COMBAT FAILS

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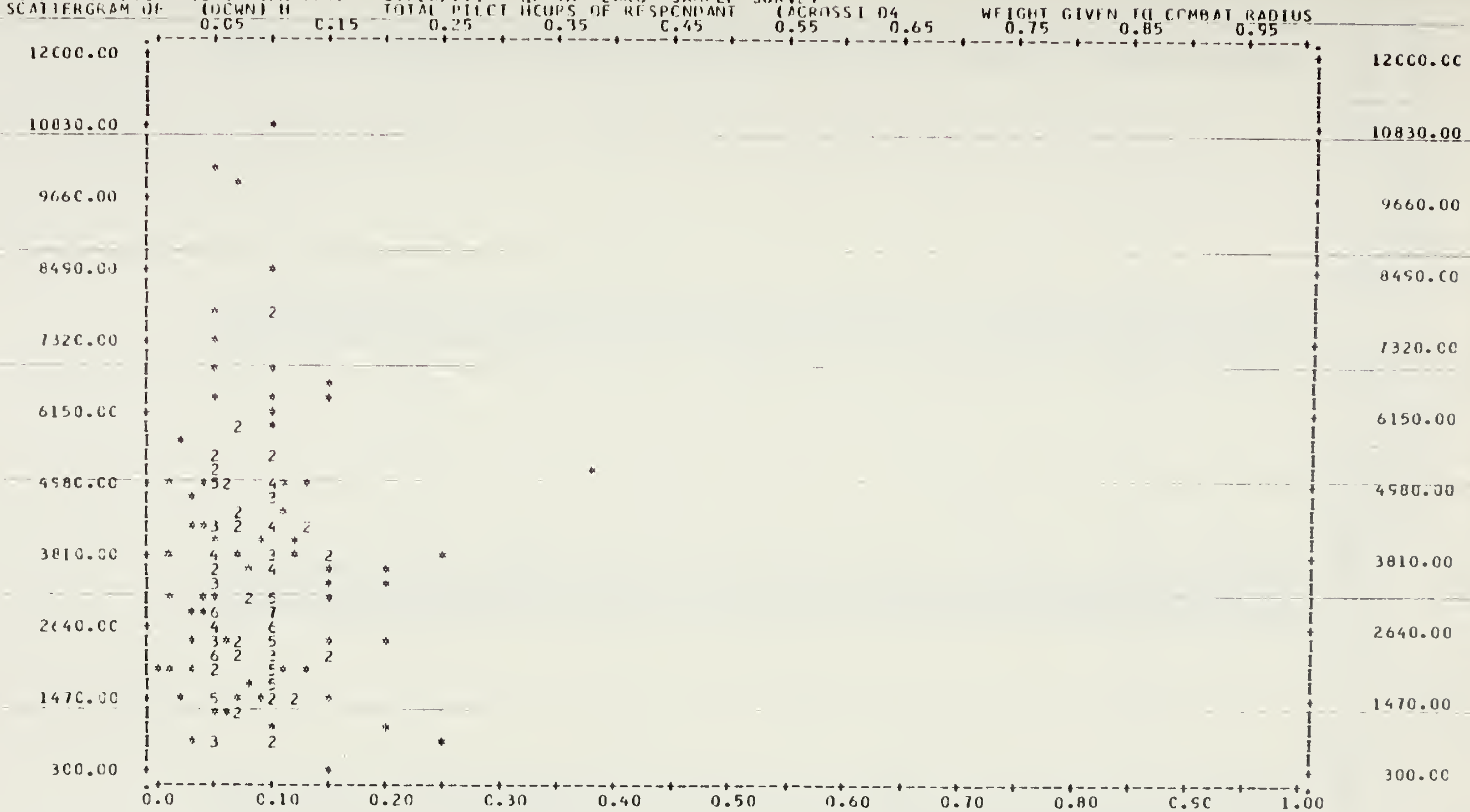
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY

SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) I 04 WEIGHT GIVEN TO COMBAT RADIUS



STATISTICS..

CORRELATION (R)-	-0.03851	R SQUARED -	0.00097	SIGNIFICANCE -	0.45252
STD ERR OF EST -	1811.97313	INTERCEPT (A) -	3572.19826	SLOPE (B) -	-337.06434
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0

FACTOR: NUMBER OF GUN BARRELS

RESPONDANT	LOWER LIMIT	FIFTIETH UTILE	UPPER LIMIT	WEIGHT
1	6.0	12.0	12.0	0.100
2	2.0	4.0	6.0	0.020
3	2.0	14.0	12.0	0.025
4	4.0	8.0	12.0	0.050
5	6.0	12.0	12.0	0.050
6	4.0	4.0	6.0	0.001
7	1.0	1.0	2.0	0.025
8	2.0	3.0	4.0	0.050
9	6.0	12.0	12.0	0.020
10	1.0	1.0	2.0	0.050
11	2.0	3.0	6.0	0.050
12	3.0	4.0	5.0	0.100
13	13.0	15.0	14.0	0.050
14	4.0	6.0	8.0	0.050
15	4.0	6.0	8.0	0.050
16	6.0	6.0	12.0	0.100
17	1.0	3.0	4.0	0.050
18	2.0	3.0	4.0	0.050
19	6.0	12.0	12.0	0.150
20	1.0	2.0	4.0	0.050
21	4.0	6.0	6.0	0.050
22	4.0	5.0	6.0	0.050
23	1.0	1.0	2.0	0.050
24	1.0	2.0	6.0	0.033
25	2.0	5.0	6.0	0.050
26	1.0	2.0	7.0	0.050
27	4.0	6.0	12.0	0.100
28	4.0	5.0	6.0	0.050
29	4.0	5.0	6.0	0.040
30	1.0	1.0	2.0	0.0
31	5.0	6.0	10.0	0.070
32	1.0	2.0	4.0	0.050
33	1.0	12.0	12.0	0.050
34	6.0	7.0	12.0	0.050
35	3.0	5.0	6.0	0.070
36	6.0	12.0	12.0	0.050
37	2.0	2.0	10.0	0.065
38	4.0	4.0	5.0	0.050
39	6.0	6.0	12.0	0.035
40	4.0	6.0	12.0	0.025
41	1.0	2.0	4.0	0.083
42	1.0	2.0	3.0	0.050
43	1.0	1.0	2.0	0.035
44	6.0	6.0	6.0	0.003
45	6.0	6.0	12.0	0.075
46	4.0	6.0	6.0	0.070
47	1.0	1.0	2.0	0.005
48	4.0	4.0	8.0	0.030
49	1.0	4.0	8.0	0.050
50	3.0	2.0	6.0	0.045

FACTOR: NUMBER OF GUN BARRELS

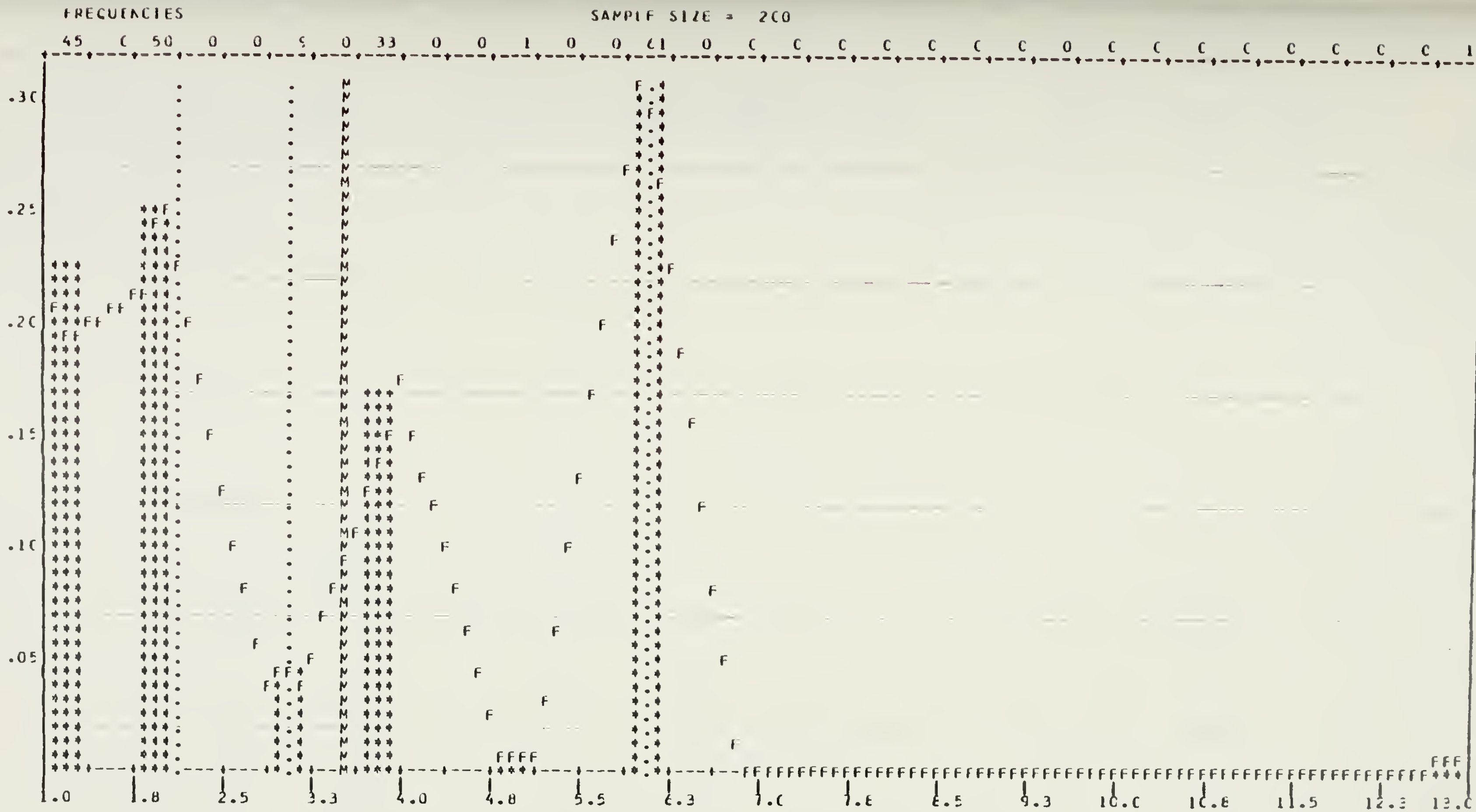
RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
51	6.0	6.0	12.0	0.050
52	6.0	6.0	12.0	0.050
53	4.0	4.0	6.0	0.0
54	1.0	1.0	2.0	0.050
55	6.0	6.0	6.0	0.050
56	1.0	4.0	6.0	0.050
57	6.0	12.0	12.0	0.060
58	2.0	5.0	8.0	0.050
59	6.0	6.0	12.0	0.050
60	1.0	2.0	2.0	0.025
61	2.0	2.0	4.0	0.050
62	6.0	6.0	12.0	0.100
63	2.0	3.0	4.0	0.020
64	1.0	1.0	2.0	0.050
65	1.0	1.0	2.0	0.050
66	3.0	6.0	7.0	0.025
67	2.0	4.0	8.0	0.100
68	1.0	1.0	2.0	0.010
69	6.0	6.0	10.0	0.050
70	1.0	1.0	2.0	0.085
71	4.0	6.0	8.0	0.025
72	2.0	4.0	6.0	0.150
73	2.0	6.0	7.0	0.040
74	6.0	9.0	12.0	0.020
75	6.0	12.0	12.0	0.040
76	1.0	3.0	6.0	0.050
77	2.0	4.0	6.0	0.050
78	2.0	3.0	6.0	0.025
79	2.0	3.0	4.0	0.050
80	6.0	6.0	12.0	0.050
81	6.0	6.0	12.0	0.020
82	6.0	6.0	12.0	0.0
83	6.0	6.0	12.0	0.050
84	3.0	6.0	9.0	0.050
85	2.0	3.0	6.0	0.050
86	2.0	2.0	4.0	0.050
87	2.0	2.0	6.0	0.010
88	1.0	6.0	12.0	0.125
89	1.0	4.0	6.0	0.050
90	2.0	5.0	7.0	0.050
91	2.0	3.0	6.0	0.200
92	1.0	1.0	2.0	0.050
93	2.0	4.0	6.0	0.050
94	4.0	4.0	5.0	0.100
95	2.0	6.0	6.0	0.100
96	6.0	6.0	8.0	0.010
97	4.0	6.0	12.0	0.075
98	6.0	6.0	12.0	0.0
99	4.0	6.0	8.0	0.050
100	4.0	6.0	8.0	0.050

FACTOR: NUMBER OF GUN BARRELS

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
101	1.0	3.0	6.0	0.005
102	1.0	1.0	1.0	0.050
103	4.0	6.0	8.0	0.050
104	2.0	6.0	8.0	0.030
105	2.0	3.0	4.0	0.100
106	4.0	5.0	6.0	0.010
107	6.0	6.0	12.0	0.025
108	2.0	5.0	10.0	0.025
109	4.0	6.0	6.0	0.050
110	4.0	5.0	6.0	0.050
111	4.0	5.0	8.0	0.025
112	2.0	3.0	4.0	0.050
113	1.0	1.0	2.0	0.050
114	6.0	6.0	12.0	0.050
115	1.0	4.0	6.0	0.020
116	6.0	6.0	12.0	0.150
117	2.0	2.0	4.0	0.025
118	4.0	6.0	6.0	0.050
119	2.0	4.0	6.0	0.040
120	2.0	4.0	6.0	0.080
121	1.0	1.0	6.0	0.0
122	2.0	6.0	12.0	0.070
123	6.0	2.0	7.0	0.040
124	6.0	12.0	12.0	0.050
125	1.0	2.0	4.0	0.050
126	1.0	1.0	2.0	0.050
127	1.0	4.0	6.0	0.030
128	2.0	4.0	6.0	0.030
129	4.0	6.0	6.0	0.030
130	2.0	2.0	4.0	0.200
131	6.0	7.0	12.0	0.100
132	2.0	3.0	6.0	0.050
133	2.0	3.0	4.0	0.050
134	6.0	6.0	6.0	0.010
135	6.0	6.0	12.0	0.100
136	1.0	1.0	6.0	0.055
137	6.0	12.0	12.0	0.050
138	6.0	6.0	12.0	0.050
139	2.0	3.0	6.0	0.050
140	6.0	6.0	12.0	0.025
141	3.0	4.0	6.0	0.050
142	6.0	6.0	12.0	0.075
143	2.0	5.0	6.0	0.020
144	6.0	12.0	12.0	0.050
145	6.0	6.0	6.0	0.010
146	1.0	6.0	7.0	0.050
147	6.0	3.0	12.0	0.010
148	6.0	8.0	12.0	0.050
149	6.0	6.0	6.0	0.040
150	4.0	5.0	6.0	0.050

FACTOR: NUMBER OF GUN BARRELS

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
151	2.0	3.0	4.0	0.100
152	6.0	12.0	12.0	0.0
153	4.0	6.0	8.0	0.050
154	4.0	6.0	6.0	0.050
155	2.0	6.0	6.0	0.100
156	2.0	4.0	6.0	0.040
157	2.0	2.0	6.0	0.080
158	4.0	6.0	6.0	0.010
159	6.0	6.0	12.0	0.010
160	1.0	1.0	2.0	0.010
161	6.0	6.0	12.0	0.100
162	2.0	4.0	6.0	0.050
163	1.0	1.0	2.0	0.085
164	1.0	1.0	2.0	0.100
165	1.0	1.0	2.0	0.050
166	1.0	3.0	6.0	0.100
167	2.0	4.0	6.0	0.060
168	6.0	6.0	12.0	0.0
169	4.0	14.0	9.0	0.050
170	6.0	6.0	6.0	0.025
171	6.0	12.0	12.0	0.060
172	2.0	6.0	4.0	0.050
173	2.0	6.0	10.0	0.070
174	2.0	5.0	6.0	0.100
175	6.0	12.0	12.0	0.075
176	1.0	3.0	6.0	0.010
177	6.0	12.0	12.0	0.050
178	6.0	8.0	12.0	0.020
179	6.0	8.0	12.0	0.040
180	6.0	12.0	12.0	0.050
181	2.0	3.0	4.0	0.050
182	2.0	6.0	14.0	0.080
183	4.0	5.0	6.0	0.100
184	3.0	4.0	6.0	0.010
185	3.0	6.0	6.0	0.070
186	6.0	6.0	12.0	0.060
187	1.0	4.0	6.0	0.100
188	1.0	2.0	4.0	0.010
189	6.0	6.0	12.0	0.050
190	6.0	12.0	12.0	0.050
191	6.0	6.0	12.0	0.025
192	1.0	1.0	2.0	0.050
193	2.0	4.0	6.0	0.050
194	6.0	6.0	12.0	0.150
195	6.0	6.0	12.0	0.050
196	6.0	12.0	12.0	0.050
197	4.0	4.0	5.0	0.025
198	3.0	4.0	6.0	0.100
199	6.0	12.0	12.0	0.075
200	2.0	6.0	7.0	0.050

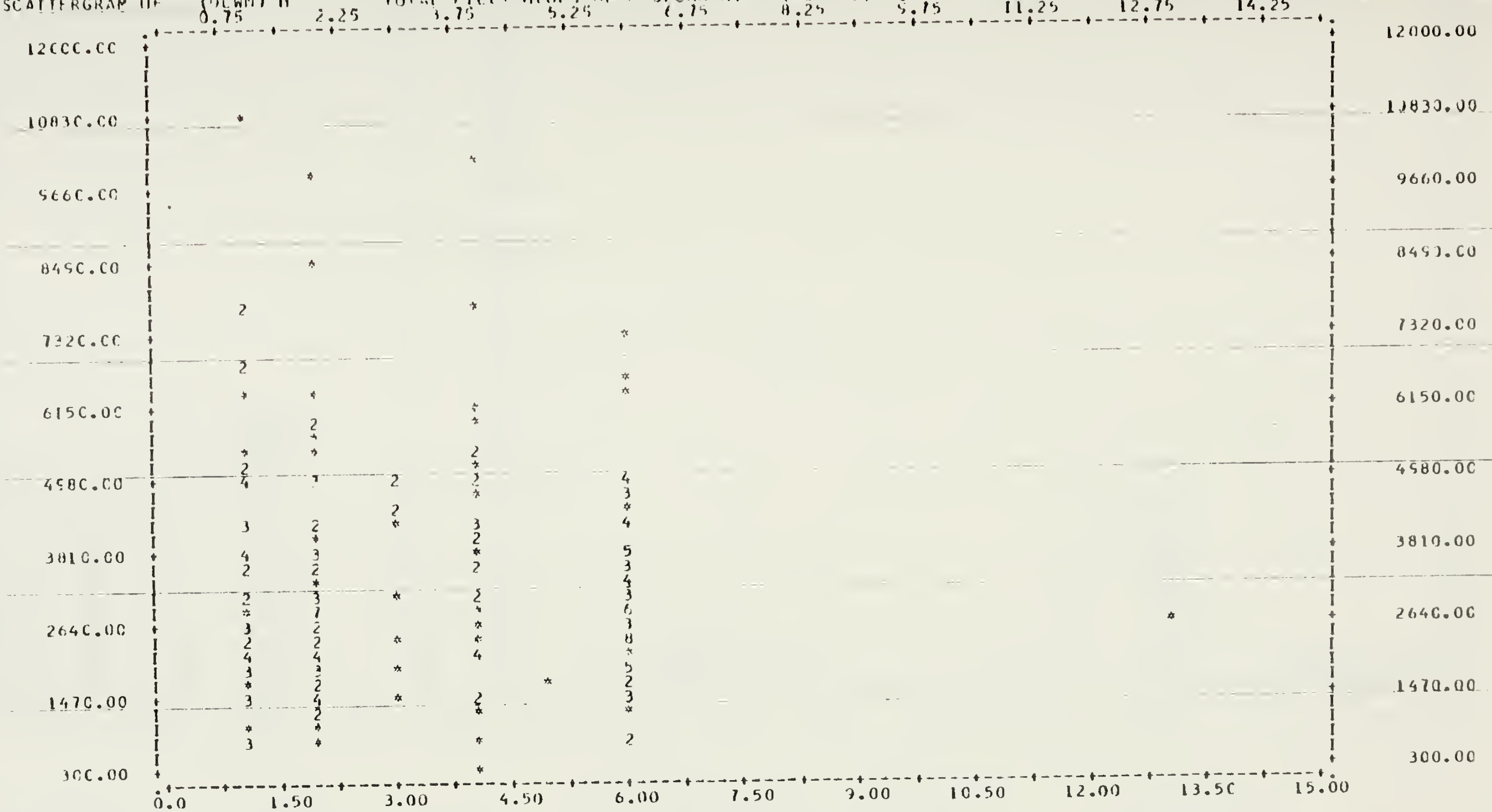


CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	3.440000E 00	VARIANCE	4.408441E 00	M3	5.598467E 00	MINIMUM	1.000000E 00
MEDIAN	3.000000E 00	STD DEV	2.099628E 00	M4	6.467610E 01	.10 QUANTILE	1.000000E 00
TRIMEAN	3.500000E 00	COEF VAR	6.103572E-01	SKEWNESS	6.040415E-01	.25 QUANTILE (HINGE)	2.000000E 00
MIDMEAN	3.259999E 00	MEAN DEV	1.839999E 00	KURTOSIS	3.279285E-01	.50 QUANTILE (MEDIAN)	3.000000E 00
MIDRANGE	7.000000E 00	RANGE	1.200000E 01	BETA1	5.514771E 00	.75 QUANTILE (HINGE)	6.000000E 00
GEOM MEAN	2.769926E 00	MIDSPREAD	4.000000E 00	BETA2	6.390126E 01	.90 QUANTILE	6.000000E 00
HARM MEAN	2.181177E 00					MAXIMUM	1.300000E 01

LOWER LIMIT FOR NO. OF GUN BARRELS

LT. PATRICK M. O'CONNELL 07/26/77 PAGE 36

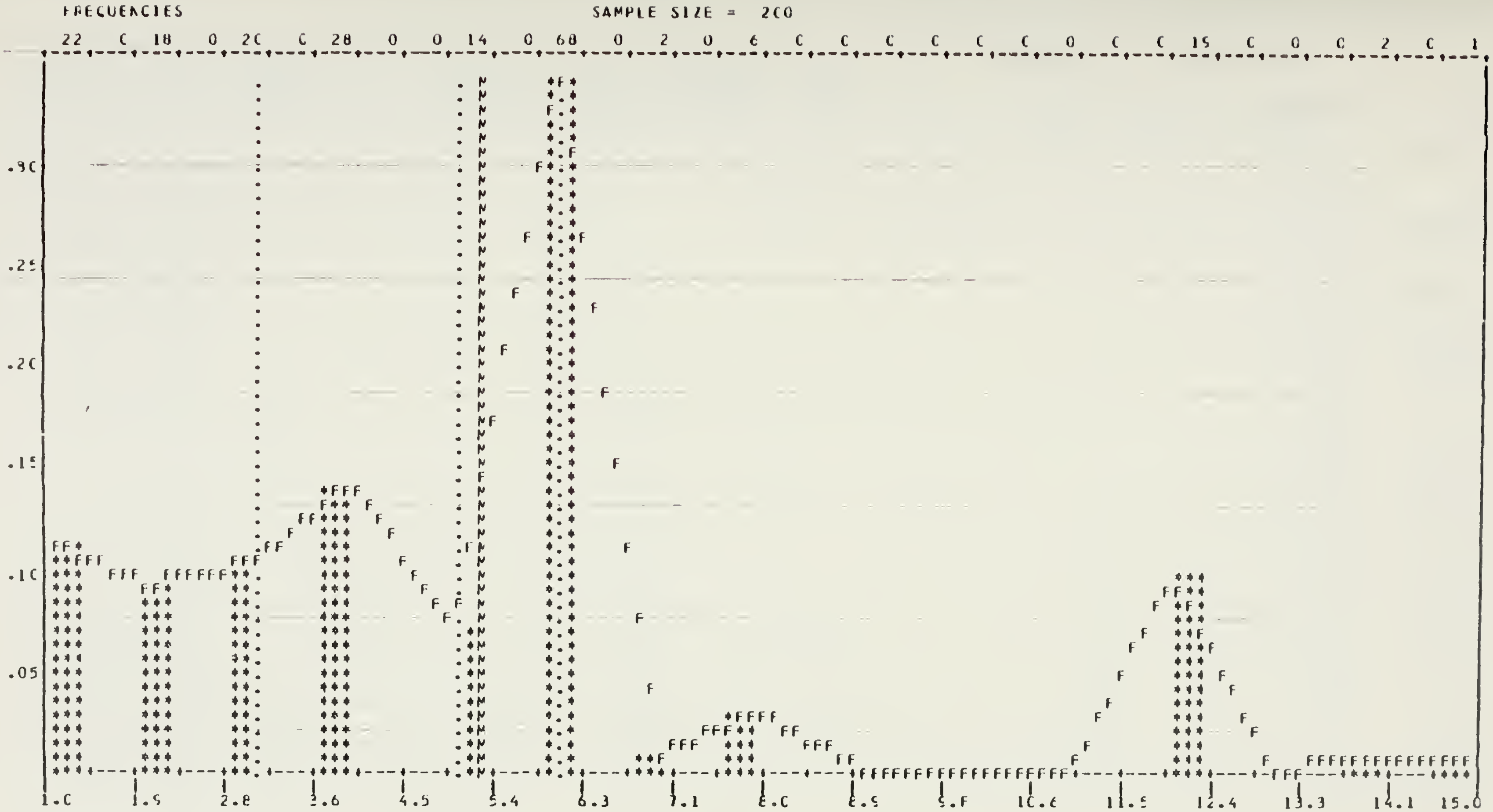
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) EL LOWER LIMIT FOR NO. OF GUN BAR



STATISTICS..

CORRELATION (R)-	-0.07073	R SQUARED -	0.00500	SIGNIFICANCE -	0.16054
STD ERR OF EST -	1807.50481	INTERCEPT (A) -	3752.38775	SLOPE (B) -	-60.71661
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0

11
10
9
8



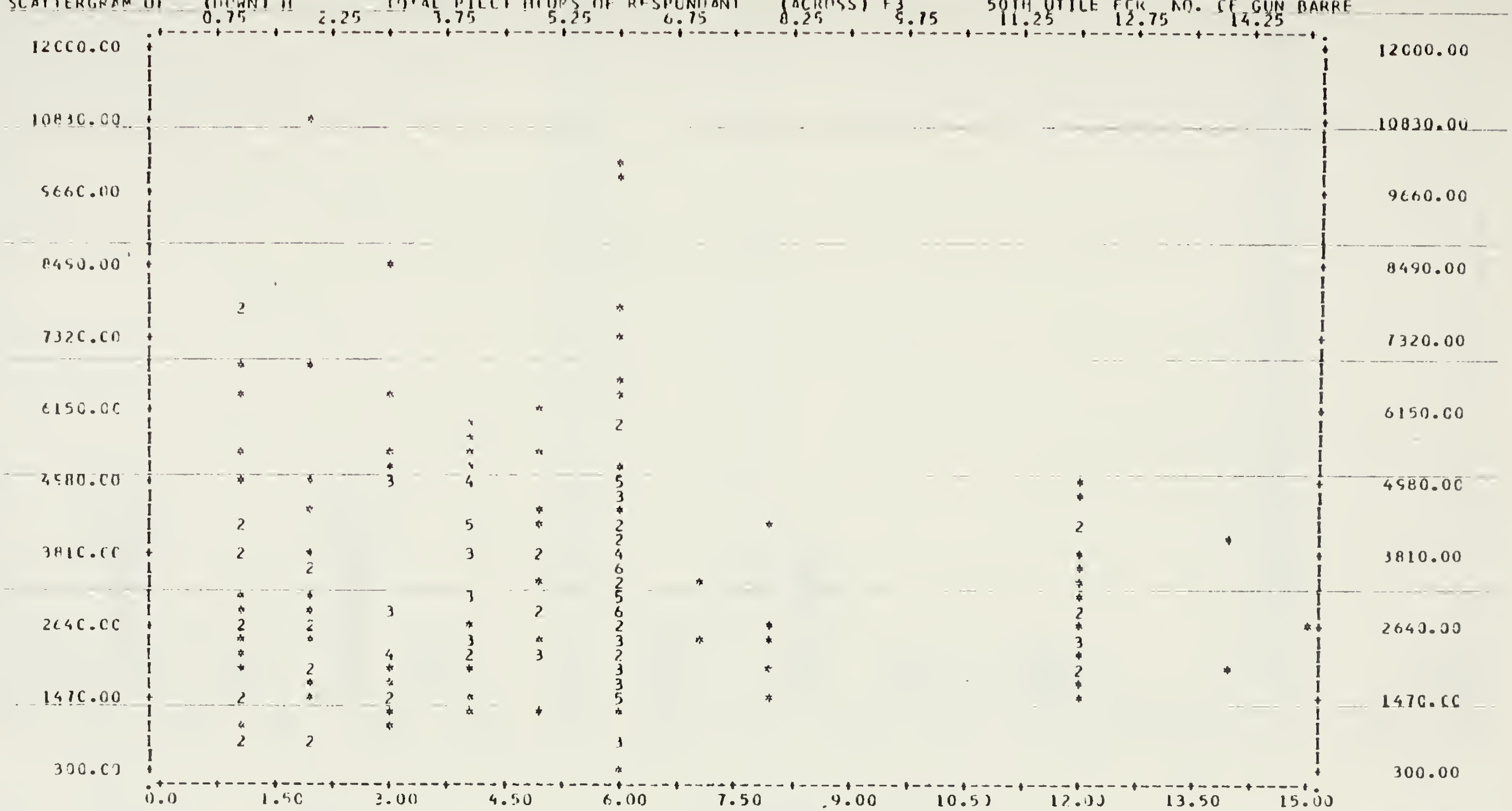
CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	5.2050000E 00	VARIANCE	9.731631E 00	M3	3.018254E 01	MINIMUM	1.0000000E 00
MEDIAN	5.0000000E 00	STD DEV	3.119556E 00	M4	3.614057E 02	.10 QUANTILE	1.0000000E 00
TRIMEAN	4.7500000E 00	COEF VAR	5.993384E-01	SKEWNESS	9.942083E-01	.25 QUANTILE (HINGE)	3.0000000E 00
MIDMEAN	5.0000000E 00	MEAN DEV	2.304599E 00	KURTOSIS	8.161764E-01	.50 QUANTILE (MEDIAN)	5.0000000E 00
MIDRANGE	8.0000000E 00	RANGE	1.400000E 01	BETA1	2.573134E 01	.75 QUANTILE (HINGE)	6.0000000E 00
GEOM MEAN	4.2461954E 00	MIDSPREAD	3.000000E 00	BETA2	3.570017E 02	.90 QUANTILE	1.2000000E 01
HARM MEAN	3.2452480E 00					MAXIMUM	1.5000000E 01

FIFTIETH UTILE FOR NO. OF GUN BARRELS

LT. PATRICK M. O'CONNELL 07/26/77 PAGE 40

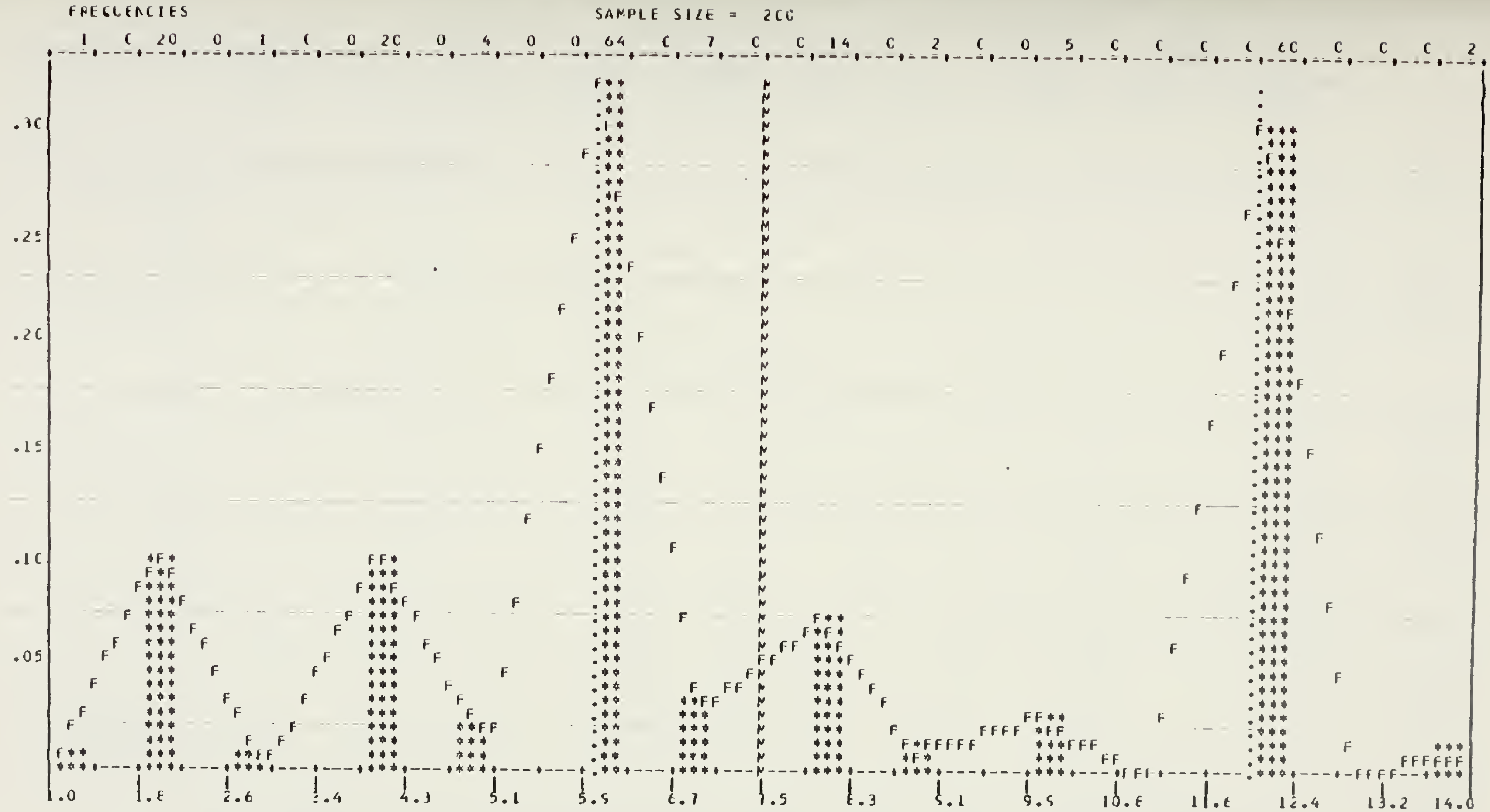
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY

SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) F3 50TH UTILE FOR NO. OF GUN BARRE



STATISTICS..

CORRELATION (R)-	-0.08553	R SQUARED -	0.00732	SIGNIFICANCE -	0.11484
STD ERR OF EST -	1805.39834	INTERCEPT (A) -	3833.81673	SLOPE (B) -	-49.53294
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	7.525000E 00	VARIANCE	1.217022E 01	M3	5.540870E 00	MINIMUM	1.000000E 00
MEDIAN	6.000000E 00	STD DEV	3.488585E 00	M4	2.620315E 02	.10 QUANTILE	2.000000E 00
TRIMEAN	7.500000E 00	COEF VAR	4.635993E-01	SKEWNESS	1.305059E-01	.25 QUANTILE (HINGE)	6.000000E 00
MIDMEAN	7.330000E 00	MEAN DEV	2.844999E 00	KURTOSIS	-1.230884E 00	.50 QUANTILE (MEDIAN)	6.000000E 00
MIDRANGE	7.500000E 00	RANGE	1.300000E 01	BETA1	9.456035E 00	.75 QUANTILE (HINGE)	1.200000E 01
GEOM MEAN	6.580134E 00	MIDSPREAD	6.000000E 00	BETA2	2.612005E 02	.90 QUANTILE	1.200000E 01
HARM MEAN	5.492230E 00					MAXIMUM	1.400000E 01

UPPER LIMIT FOR NO. OF GUN BARRELS

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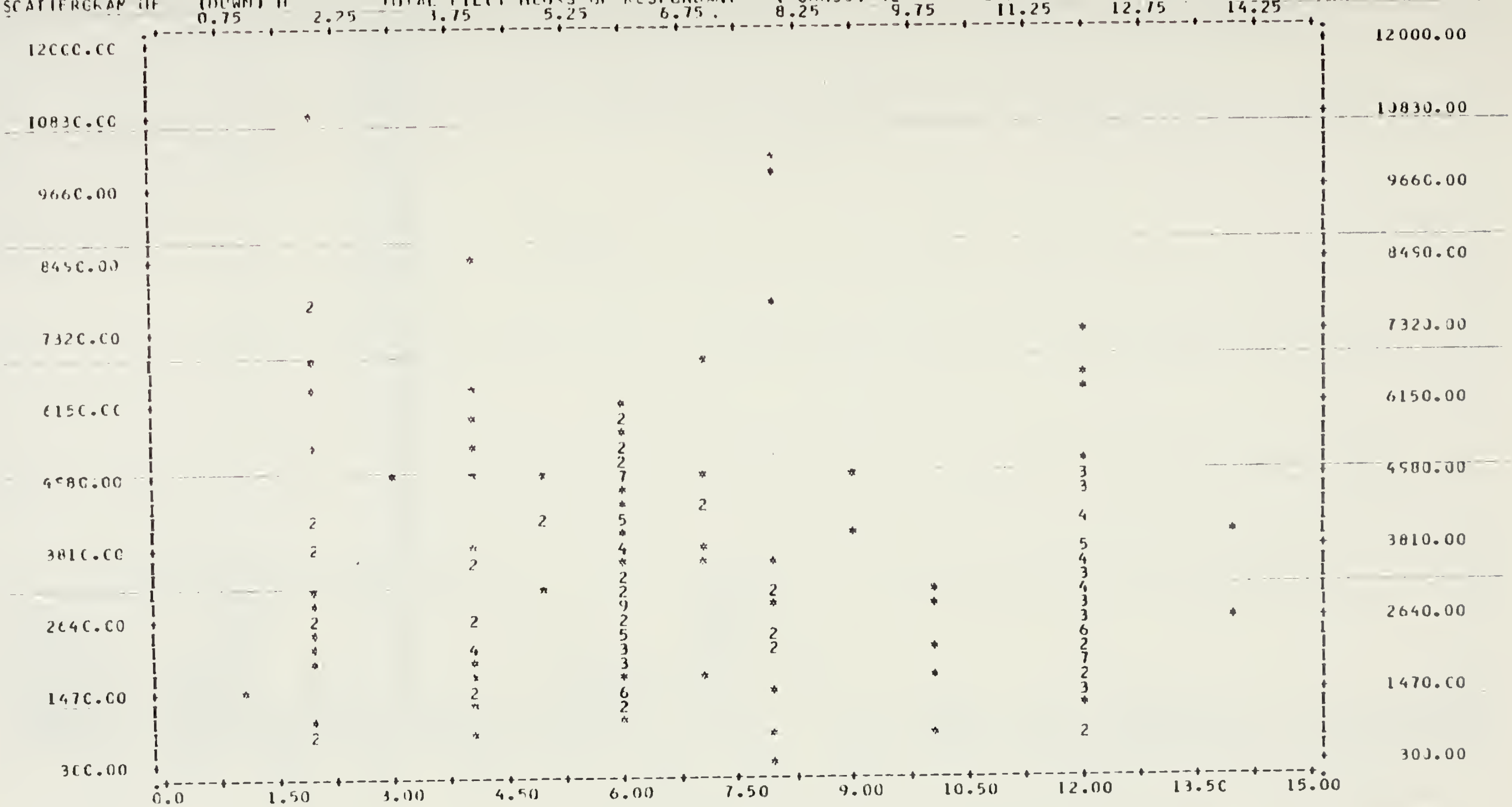
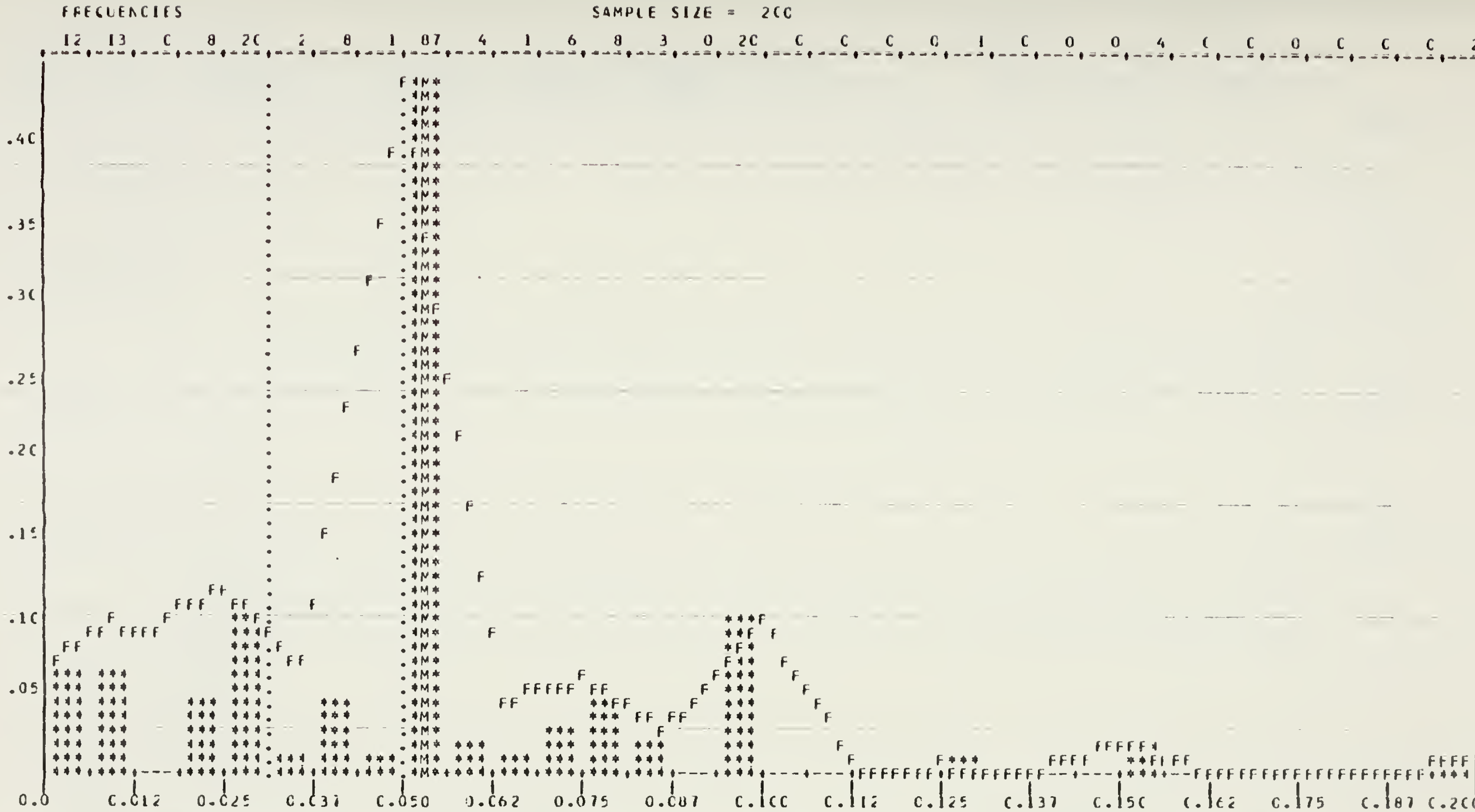
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY

SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) E2 UPPER LIMIT FOR NO. OF GUN BARRE



STATISTICS..

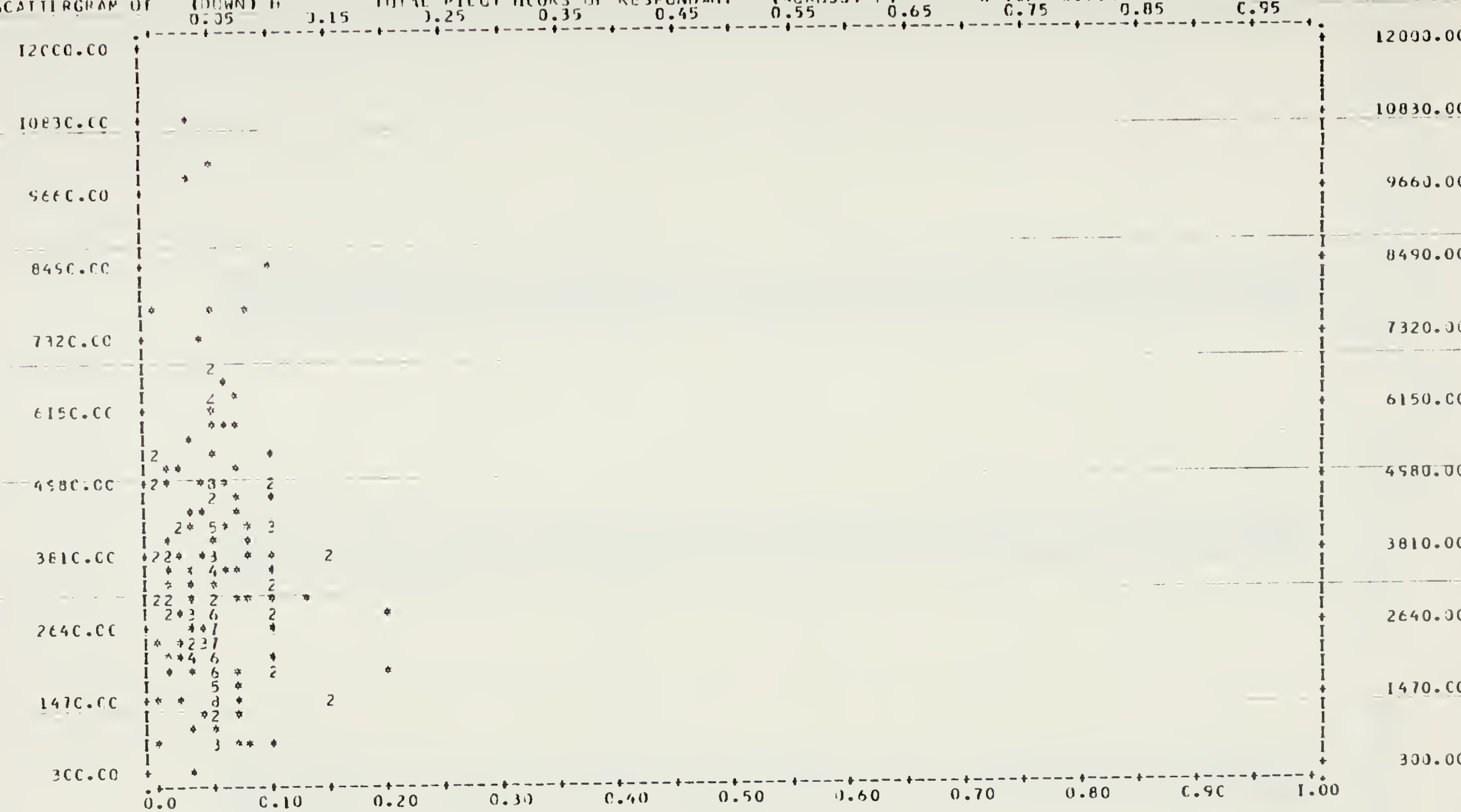
CORRELATION (R)-	-0.11268	R SQUARED -	0.01270	SIGNIFICANCE -	0.05653
STD ERR OF EST -	1800.49803	INTERCEPT (A) -	3982.42503	SLOPE (B) -	-58.47795
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	5.1699999E-02	VARIANCE	1.112361E-03	M3	5.161983E-05	MINIMUM	0.0
MEDIAN	4.9999998E-02	STD DEV	3.335206E-02	M4	8.223103E-06	.10 QUANTILE	9.999998E-03
TRIMEAN	4.562496E-02	COEF VAR	6.451079E-01	SKEWNESS	1.391387E 00	.25 QUANTILE (HINGE)	3.000000E-02
MIDMEAN	4.625499E-02	MEAN DEV	2.103000E-02	KURTOSIS	3.645755E 00	.50 QUANTILE (MEDIAN)	4.999998E-02
MIDRANGE	9.999996E-02	RANGE	2.000000E-01	BETA1	9.068120E-05	.75 QUANTILE (HINGE)	5.249998E-02
		MIDSPREAD	2.249998E-02	BETA2	8.059487E-06	.90 QUANTILE	9.999996E-02
						MAXIMUM	2.000000E-01

WEIGHT GIVEN TO NO. OF GUN BARRELS

FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) F4 WEIGHT GIVEN TO NO. OF GUN BARRE



STATISTICS..

CORRELATION (R)-	-0.04023	R SQUARED -	0.00162	SIGNIFICANCE -	0.28632
STD ERR OF EST -	1810.57175	INTERCEPT (A) -	3656.14771	SLOPE (B) -	-2174.77142
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0

FACTOR: MISSILE SPEED (MACH NO.)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
1	2.00	2.00	3.00	0.200
2	1.50	2.00	3.00	0.120
3	2.00	2.50	3.00	0.100
4	1.25	1.75	2.50	0.075
5	3.00	4.00	6.00	0.160
6	4.00	4.00	6.00	0.200
7	0.70	1.20	2.00	0.150
8	2.00	2.00	4.00	0.200
9	1.50	2.50	4.00	0.250
10	2.50	3.00	3.50	0.100
11	2.50	3.00	3.50	0.130
12	1.00	2.00	3.00	0.050
13	1.50	2.00	2.50	0.100
14	2.00	2.50	3.50	0.100
15	0.50	1.00	2.00	0.100
16	1.50	1.70	3.00	0.150
17	4.00	5.00	9.00	0.0
18	1.50	2.00	2.50	0.100
19	1.50	2.00	3.50	0.0
20	1.00	1.75	2.50	0.100
21	4.00	4.00	5.00	0.150
22	1.50	1.70	2.50	0.050
23	1.00	1.30	1.50	0.050
24	1.50	2.00	2.50	0.200
25	3.00	3.00	4.00	0.050
26	1.50	1.70	4.00	0.100
27	1.70	2.00	3.00	0.100
28	2.50	3.00	4.00	0.080
29	1.50	2.00	2.50	0.150
30	1.50	1.60	2.10	0.070
31	1.50	2.00	3.00	0.213
32	1.50	2.00	3.00	0.200
33	3.00	4.00	6.00	0.105
34	2.00	2.50	3.00	0.075
35	3.40	4.00	5.00	0.190
36	1.00	1.30	1.50	0.150
37	1.30	2.00	3.50	0.140
38	2.50	3.00	5.00	0.100
39	2.00	2.10	4.00	0.100
40	1.00	2.00	4.00	0.100
41	1.00	2.00	3.00	0.083
42	4.00	5.00	6.00	0.150
43	1.50	2.10	2.50	0.125
44	2.00	2.70	4.50	0.300
45	1.60	2.00	2.50	0.120
46	0.90	1.10	2.00	0.200
47	3.00	3.50	4.00	0.200
48	4.00	5.00	6.00	0.030
49	4.00	4.20	4.70	0.250
50	2.00	2.00	4.00	0.350

FACTOR: MISSILE SPEED (MACH NO.)

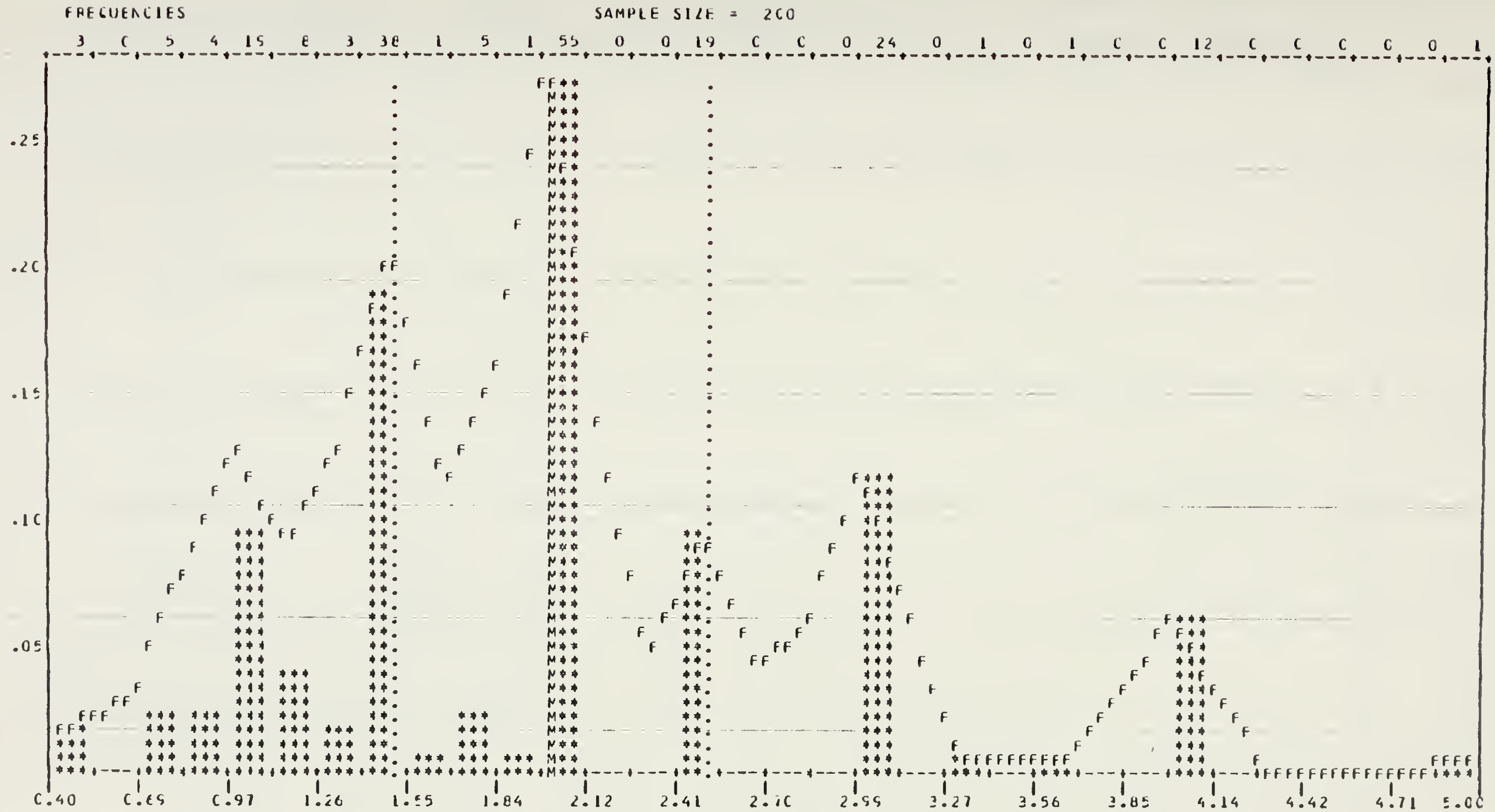
RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
51	4.00	5.00	6.00	0.150
52	2.50	3.00	5.00	0.200
53	3.00	4.00	5.00	0.150
54	2.50	3.00	3.50	0.100
55	1.95	2.95	4.00	0.100
56	1.50	2.30	3.50	0.050
57	2.00	3.00	4.00	0.125
58	2.00	3.00	5.00	0.225
59	1.50	2.00	3.00	0.150
60	3.00	3.50	5.00	0.100
61	2.00	3.00	4.00	0.150
62	3.00	4.00	5.00	0.150
63	2.00	3.00	4.00	0.025
64	2.50	3.00	4.50	0.150
65	2.00	2.50	3.00	0.100
66	4.00	4.80	5.30	0.200
67	1.20	3.00	5.00	0.200
68	2.00	3.50	5.00	0.150
69	4.00	4.00	8.00	0.050
70	0.90	3.00	5.00	0.150
71	2.50	3.00	4.50	0.200
72	1.50	2.00	3.00	0.100
73	1.00	1.50	3.00	0.150
74	1.60	2.00	3.00	0.100
75	3.00	3.10	5.00	0.160
76	1.80	3.00	3.50	0.250
77	1.00	1.40	2.00	0.100
78	1.00	1.50	2.50	0.050
79	3.70	4.30	6.00	0.150
80	2.50	3.00	3.50	0.250
81	5.00	6.00	8.00	0.150
82	2.00	2.50	3.00	0.200
83	2.00	3.00	4.00	0.125
84	2.00	3.20	4.00	0.100
85	1.00	1.80	3.00	0.100
86	2.50	3.00	5.00	0.250
87	3.00	2.00	3.50	0.250
88	2.00	4.00	6.00	0.225
89	2.00	2.50	3.00	0.150
90	1.20	2.00	3.50	0.100
91	2.00	2.50	4.00	0.250
92	0.50	1.50	2.00	0.100
93	1.00	1.50	2.00	0.050
94	2.00	3.00	4.00	0.100
95	0.90	1.70	3.00	0.100
96	1.80	2.00	2.50	0.100
97	1.50	2.00	3.00	0.075
98	1.50	2.00	3.00	0.200
99	1.50	2.00	4.00	0.150
100	2.00	2.50	3.50	0.100

FACTOR: MISSILE SPEED (MACH NO.)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
101	3.00	4.00	5.00	0.100
102	1.00	2.20	2.50	0.150
103	2.00	2.50	4.00	0.100
104	1.00	1.50	3.00	0.200
105	1.50	2.00	4.00	0.150
106	3.00	3.00	4.00	0.100
107	2.00	2.50	3.00	0.100
108	3.00	4.50	5.00	0.150
109	2.50	2.80	3.20	0.200
110	1.50	2.00	4.50	0.200
111	2.00	3.50	6.00	0.100
112	2.00	3.00	4.00	0.200
113	0.83	2.20	4.00	0.125
114	2.00	2.50	5.00	0.150
115	2.00	2.70	4.00	0.150
116	1.20	2.00	2.50	0.020
117	2.00	3.00	3.50	0.150
118	2.00	3.00	4.00	0.150
119	1.50	2.70	3.30	0.125
120	1.40	1.60	2.00	0.075
121	2.00	4.00	5.00	0.090
122	2.00	2.50	3.50	0.200
123	2.50	3.00	4.00	0.200
124	2.50	4.00	5.00	0.150
125	3.00	4.00	5.00	0.120
126	2.50	3.00	3.50	0.200
127	2.00	3.00	4.00	0.150
128	2.00	3.00	4.00	0.075
129	1.00	1.10	1.50	0.200
130	2.00	3.00	4.00	0.050
131	2.00	2.50	3.00	0.150
132	2.00	2.50	5.00	0.100
133	2.00	3.00	4.00	0.100
134	2.00	3.50	4.00	0.150
135	2.50	2.50	5.00	0.100
136	2.50	2.50	2.50	0.040
137	2.00	2.00	3.50	0.100
138	2.00	3.20	5.00	0.200
139	4.00	5.00	6.00	0.125
140	3.00	3.50	4.00	0.150
141	2.50	3.30	4.00	0.100
142	2.00	2.00	3.00	0.125
143	3.00	3.00	4.00	0.050
144	2.00	1.50	3.00	0.075
145	3.00	3.50	4.00	0.100
146	3.00	4.00	5.00	0.150
147	1.00	2.00	3.50	0.050
148	2.50	2.50	4.00	0.250
149	1.20	1.40	2.00	0.150
150	1.50	2.00	2.50	0.150

FACTOR: MISSILE SPEED (MACH NO.)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
151	1.00	1.50	2.50	0.200
152	1.50	2.50	3.00	0.165
153	2.00	3.00	4.00	0.150
154	2.00	2.50	4.00	0.150
155	2.50	3.50	4.50	0.100
156	1.50	2.00	2.50	0.120
157	3.00	4.00	5.00	0.150
158	1.50	1.80	2.00	0.250
159	3.00	4.00	5.00	0.150
160	0.90	1.10	1.50	0.010
161	1.50	2.00	3.00	0.150
162	4.00	7.00	9.00	0.175
163	2.00	3.00	4.00	0.130
164	1.00	1.90	3.00	0.200
165	2.00	2.20	3.00	0.150
166	0.70	1.50	1.80	0.100
167	2.00	2.50	3.00	0.250
168	2.00	2.30	3.50	0.100
169	1.00	2.50	3.00	0.050
170	2.00	3.00	4.00	0.050
171	1.00	2.50	3.00	0.065
172	2.00	1.80	3.00	0.050
173	2.00	2.50	4.00	0.125
174	2.00	2.00	4.00	0.150
175	0.40	1.20	1.50	0.125
176	1.50	2.00	3.00	0.150
177	1.50	2.00	3.00	0.150
178	1.20	1.80	3.00	0.050
179	1.20	1.80	2.00	0.180
180	1.80	2.10	3.00	0.200
181	3.00	5.00	6.00	0.050
182	1.50	1.80	3.00	0.125
183	1.50	2.30	3.00	0.050
184	3.00	3.50	6.00	0.070
185	1.50	1.80	2.00	0.100
186	3.00	3.50	4.00	0.120
187	1.50	2.00	4.00	0.100
188	3.00	3.00	6.00	0.100
189	1.50	2.30	2.50	0.200
190	2.00	3.00	4.00	0.150
191	1.50	1.50	2.50	0.100
192	4.00	4.00	6.00	0.150
193	1.40	4.00	3.10	0.150
194	2.00	4.00	5.00	0.150
195	3.00	3.00	5.00	0.150
196	0.80	2.00	2.50	0.200
197	1.20	1.20	4.00	0.100
198	1.50	1.60	2.00	0.350
199	1.50	1.80	2.80	0.100
200	0.70	1.50	3.00	0.150



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	2.002645E 00	VARIANCE	7.313691E-01	M3	5.133274E-01	MINIMUM	4.000000E-01
MEDIAN	2.000000E 00	STD DEV	8.552012E-01	M4	1.868766E 00	.10 QUANTILE	1.000000E 00
TRIMEAN	2.000000E 00	COEF VAR	4.270349E-01	SKEWNESS	8.207096E-01	.25 QUANTILE (HINGE)	1.500000E 00
MIDMEAN	1.874495E 00	MEAN DEV	6.333500E-01	KURTOSIS	4.935551E-01	.50 QUANTILE (MEDIAN)	2.000000E 00
MIDRANGE	2.700000E 00	RANGE	4.599999E 00	BETA1	5.056533E-01	.75 QUANTILE (HINGE)	2.500000E 00
GEOM MEAN	1.825171E 00	MIDSPREAD	1.000000E 00	BETA2	1.847260E 00	.90 QUANTILE	3.000000E 00
HARM MEAN	1.643897E 00					MAXIMUM	5.000000E 00

LOWER LIMIT FOR MISSILE SPEED

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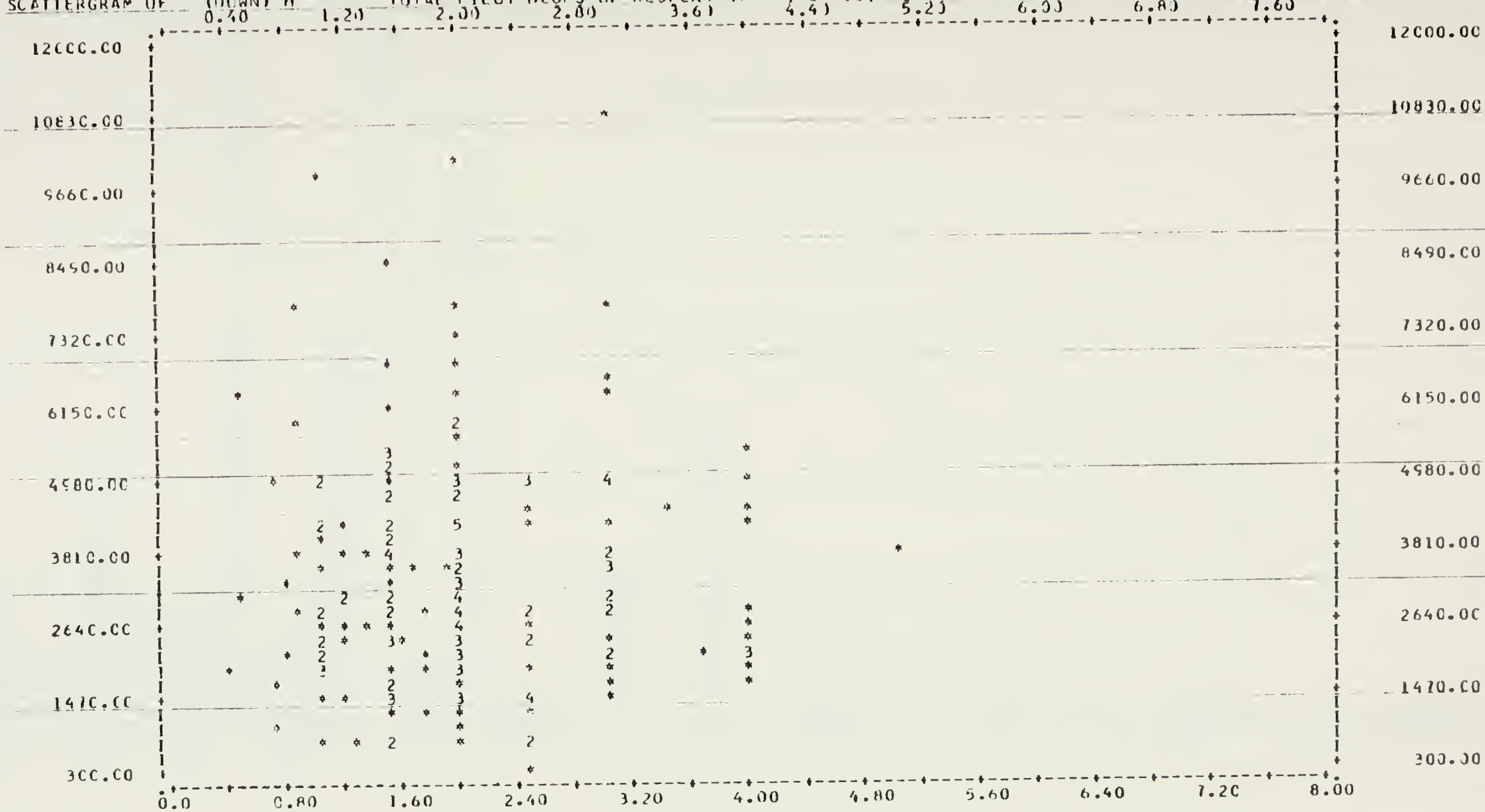
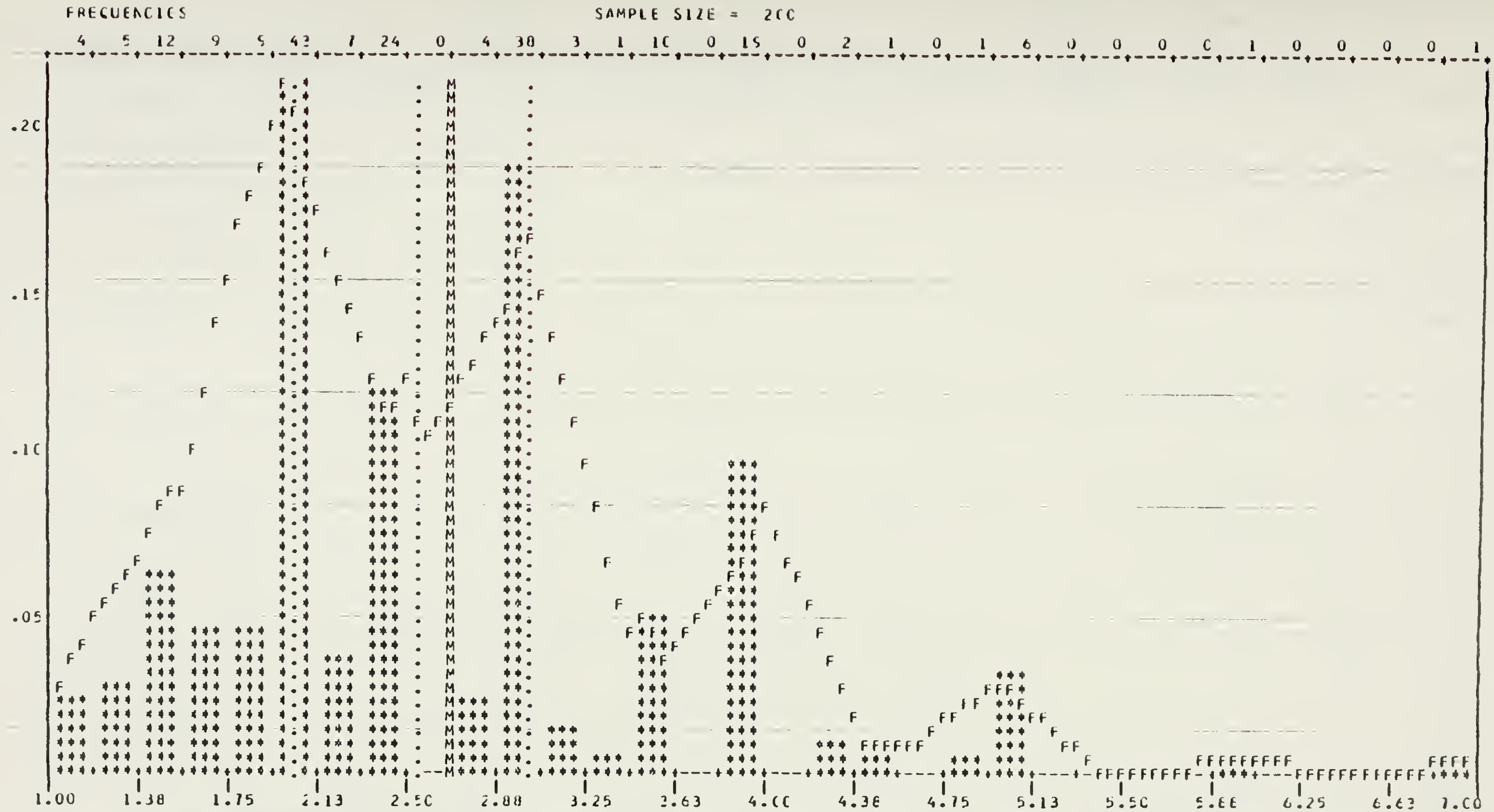
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) FL LOWERLIMIT FOR MISSILE SPEED



STATISTICS..

CORRELATION (R)-	0.00859	R SQUARED -	0.00007	SIGNIFICANCE -	0.45207
STD ERR OF EST -	1811.97188	INTERCEPT (A) -	3507.27926	SLOPE (B) -	18.14874
PLOTTED VALUES -	159	EXCLUDED VALUES-	1	MISSING VALUES -	0



CENTRAL TENDENCY	
MEAN	2.656245E 00
MEDIAN	2.500000E 00
TRIMEAN	2.500000E 00
MIDMEAN	2.495455E 00
MIDRANGE	4.000000E 00
GEOM MEAN	2.468551E 00
HARM MEAN	2.232553E 00

SPREAD	
VARIANCE	9.785662E-01
STD DEV	9.892250E-01
COEF VAR	3.724142E-01
MEAN DEV	7.632501E-01
RANGE	6.000000E 00
MIDSPREAD	1.000000E 00

HIGHER CENTRAL MOMENTS	
M3	1.011440E 00
M4	4.383410E 00
SKEWNESS	1.044E52E 00
KURTOSIS	1.577535E 00
BETA1	9.963198E-01
BETA2	4.324255E 00

DISTRIBUTION	
MINIMUM	1.000000E 00
.10 QUANTILE	1.500000E 00
.25 QUANTILE (HINGE)	2.000000E 00
.50 QUANTILE (MEDIAN)	2.500000E 00
.75 QUANTILE (HINGE)	3.000000E 00
.90 QUANTILE	4.000000E 00
MAXIMUM	7.000000E 00

FIFTIETH UTILE FOR MISSILE SPEED

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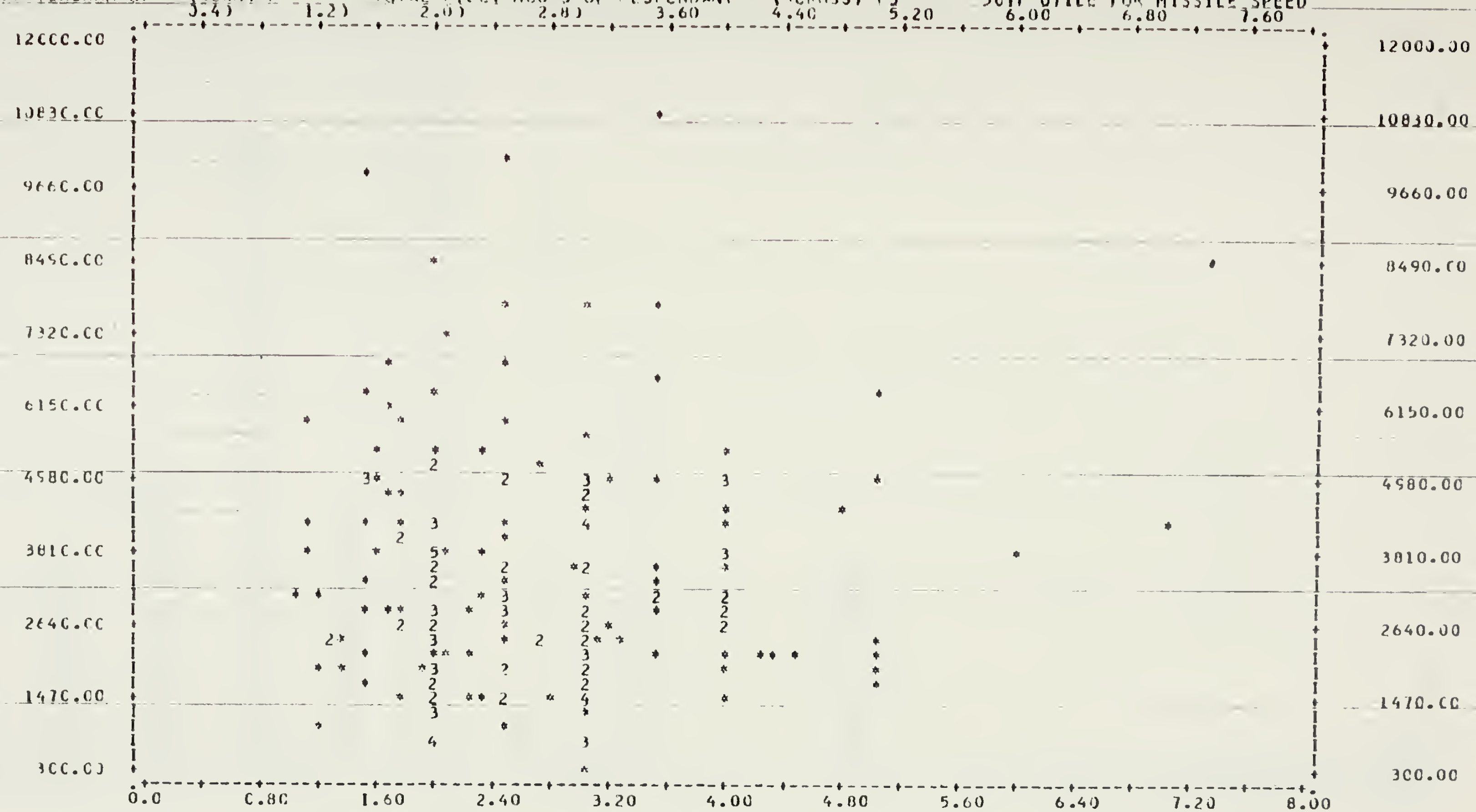
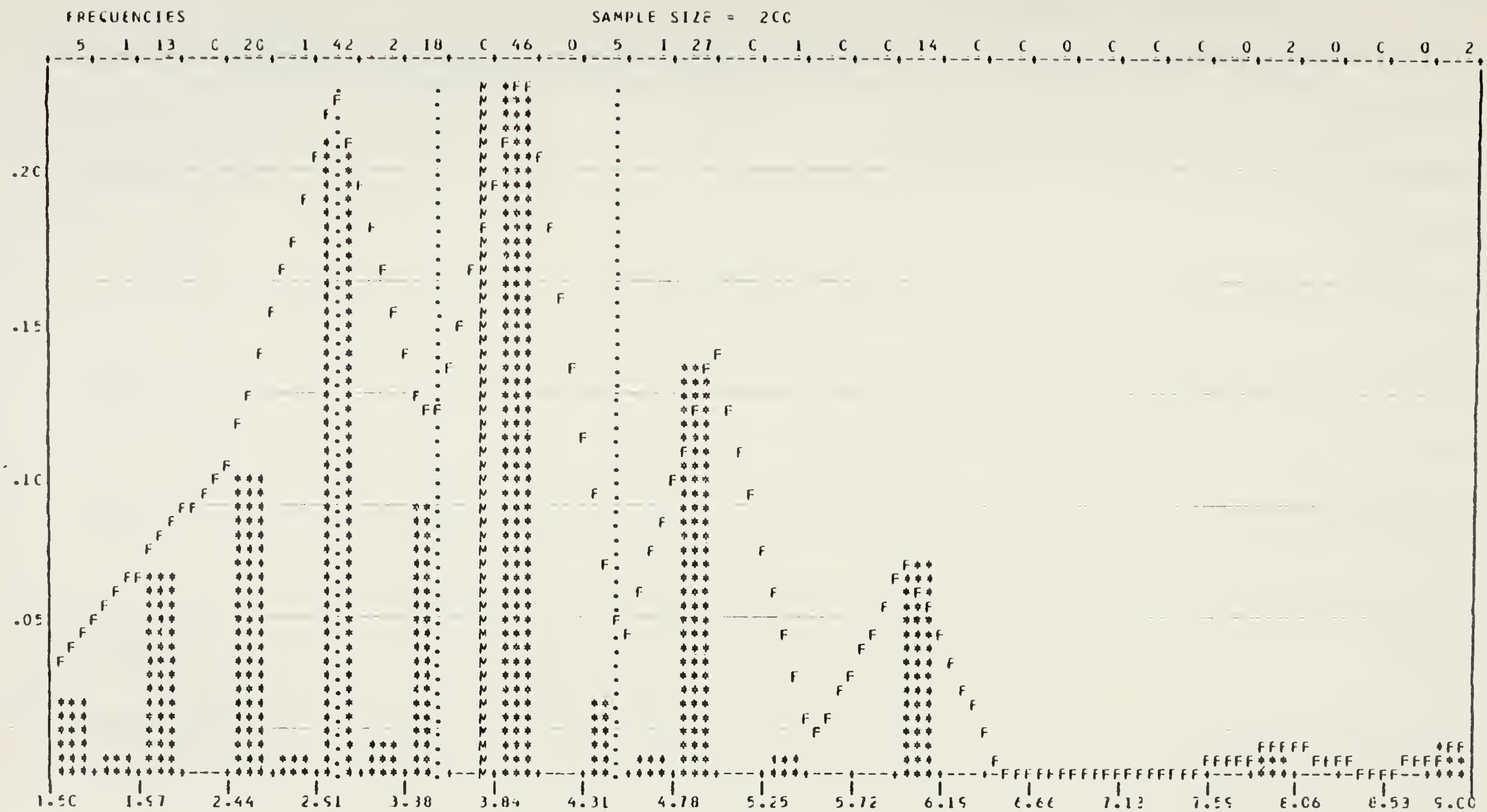
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) F3 50TH UTILE FOR MISSILE SPEED



STATISTICS..

CORRELATION (R)-	-0.00122	R SQUARED -	0.00000	SIGNIFICANCE -	0.49318
STD ERR OF EST -	1812.33741	INTERCEPT (A) -	3549.62123	SLOPE (B) -	-2.22781
PLOTTED VALUES -	159	EXCLUDED VALUES-	1	MISSING VALUES -	0



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	3.766500E 00	VARIANCE	1.704047E 00	M3	2.307297E 00	MINIMUM	1.500000E 00
MEDIAN	3.500000E 00	STD DEV	1.305391E 00	M4	1.470751E 01	.10 QUANTILE	2.500000E 00
TRIMEAN	3.625000E 00	COEF VAR	3.465794E-01	SKEWNESS	1.037245E 00	.25 QUANTILE (HINGE)	3.000000E 00
MIDMEAN	3.565555E 00	MEAN DEV	9.985000E-01	KURTOSIS	2.064959E 00	.50 QUANTILE (MEDIAN)	3.500000E 00
MIDRANGE	5.250000E 00	RANGE	7.500000E 00	BETA1	2.272804E 00	.75 QUANTILE (HINGE)	4.500000E 00
GEOM MEAN	3.555682E 00	MIDSPREAD	1.500000E 00	BETA2	1.445982E 01	.90 QUANTILE	5.000000E 00
HARM MEAN	3.350755E 00					MAXIMUM	9.000000E 00

UPPER LIMIT FOR MISSILE SPEED

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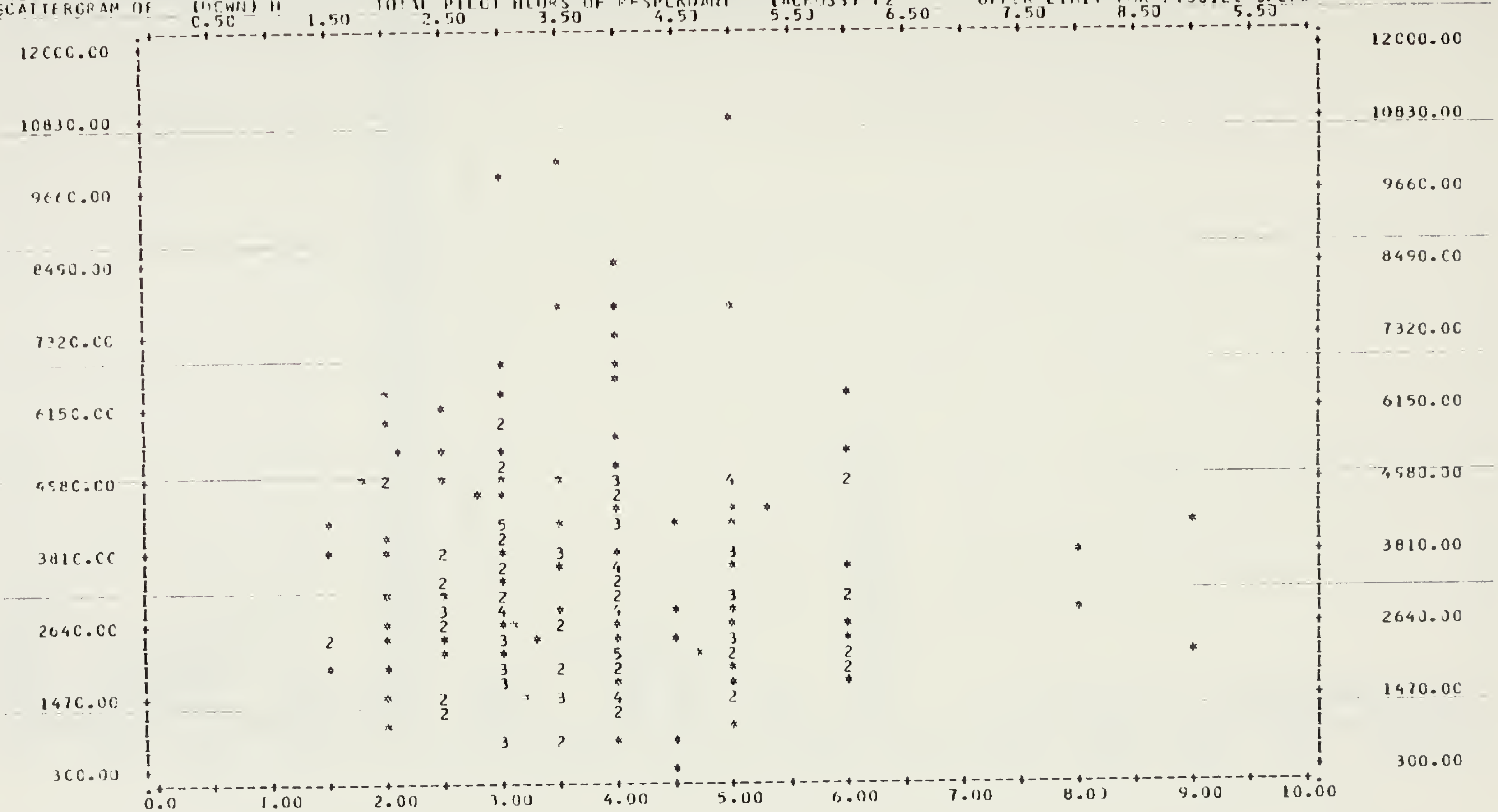
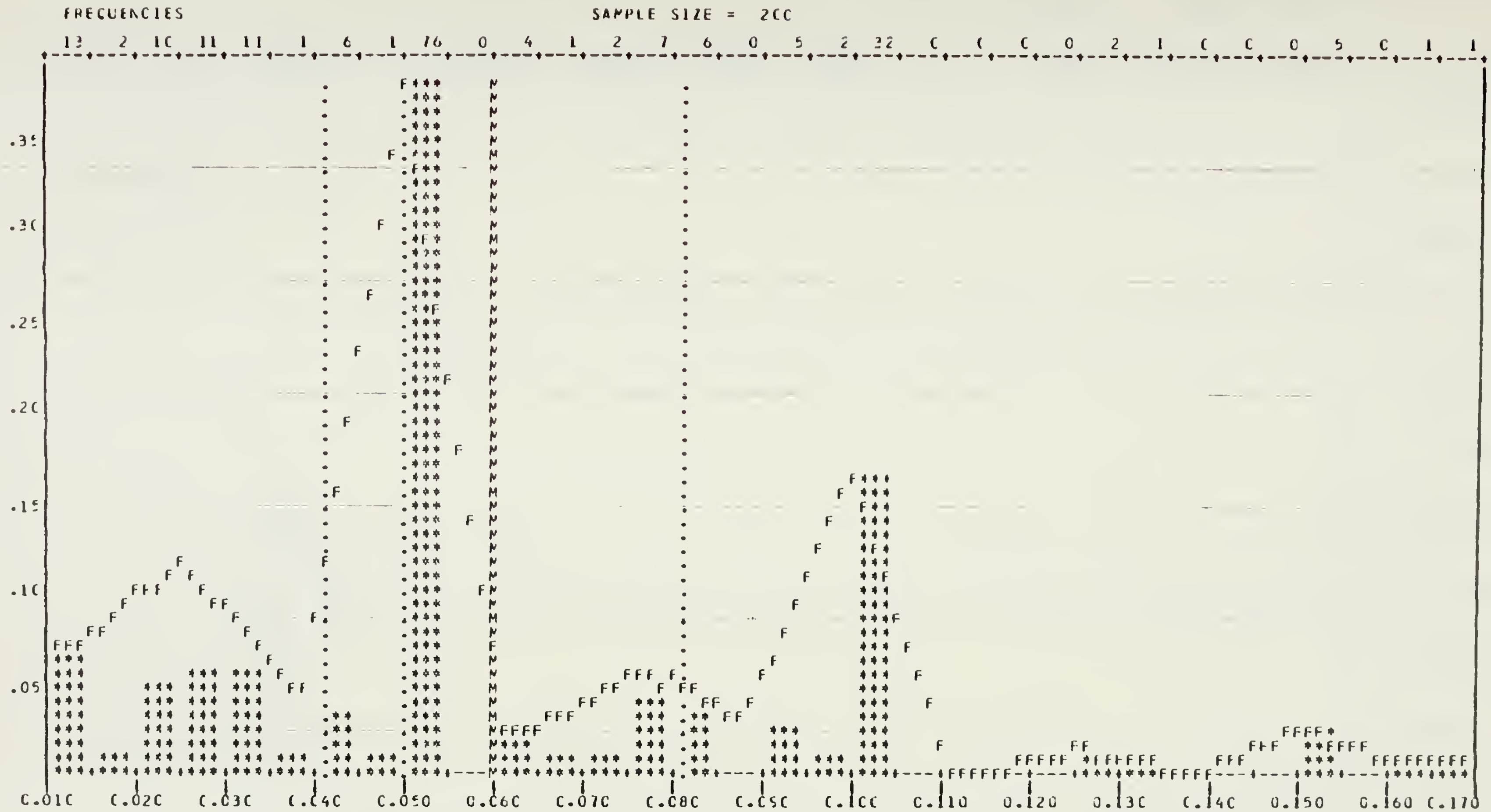
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY

SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) F2 UPPER LIMIT FOR MISSILE SPEED



STATISTICS..

CORRELATION (R)-	-0.01008	R SQUARED -	0.00010	SIGNIFICANCE -	0.44381
STD ERR OF EST -	1811.94669	INTERCEPT (A) -	3596.34755	SLOPE (B) -	-13.95600
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	5.522459E-02	VARIANCE	1.126485E-03	M3	3.252503E-05	MINIMUM	9.999998E-03
MEDIAN	4.999998E-02	STD DEV	3.355294E-02	M4	4.475213E-06	.10 QUANTILE	2.000000E-02
TRIMEAN	5.537497E-02	COEF VAR	5.672088E-01	SKEWNESS	8.579737E-01	.25 QUANTILE (HINGE)	3.999995E-02
MIDMEAN	5.376459E-02	MEAN DEV	2.380500E-02	KURTOSIS	5.141630E-01	.50 QUANTILE (MEDIAN)	4.999998E-02
MIDRANGE	8.999997E-02	RANGE	1.599999E-01	BETA1	3.203881E-05	.75 QUANTILE (HINGE)	8.149993E-02
GEOM MEAN	4.931059E-02	MIDSPREAD	4.149994E-02	BETA2	4.423629E-06	.90 QUANTILE	9.999996E-02
HARM MEAN	3.655051E-02					MAXIMUM	1.700000E-01

WEIGHT GIVEN TO MISSILE SPEED

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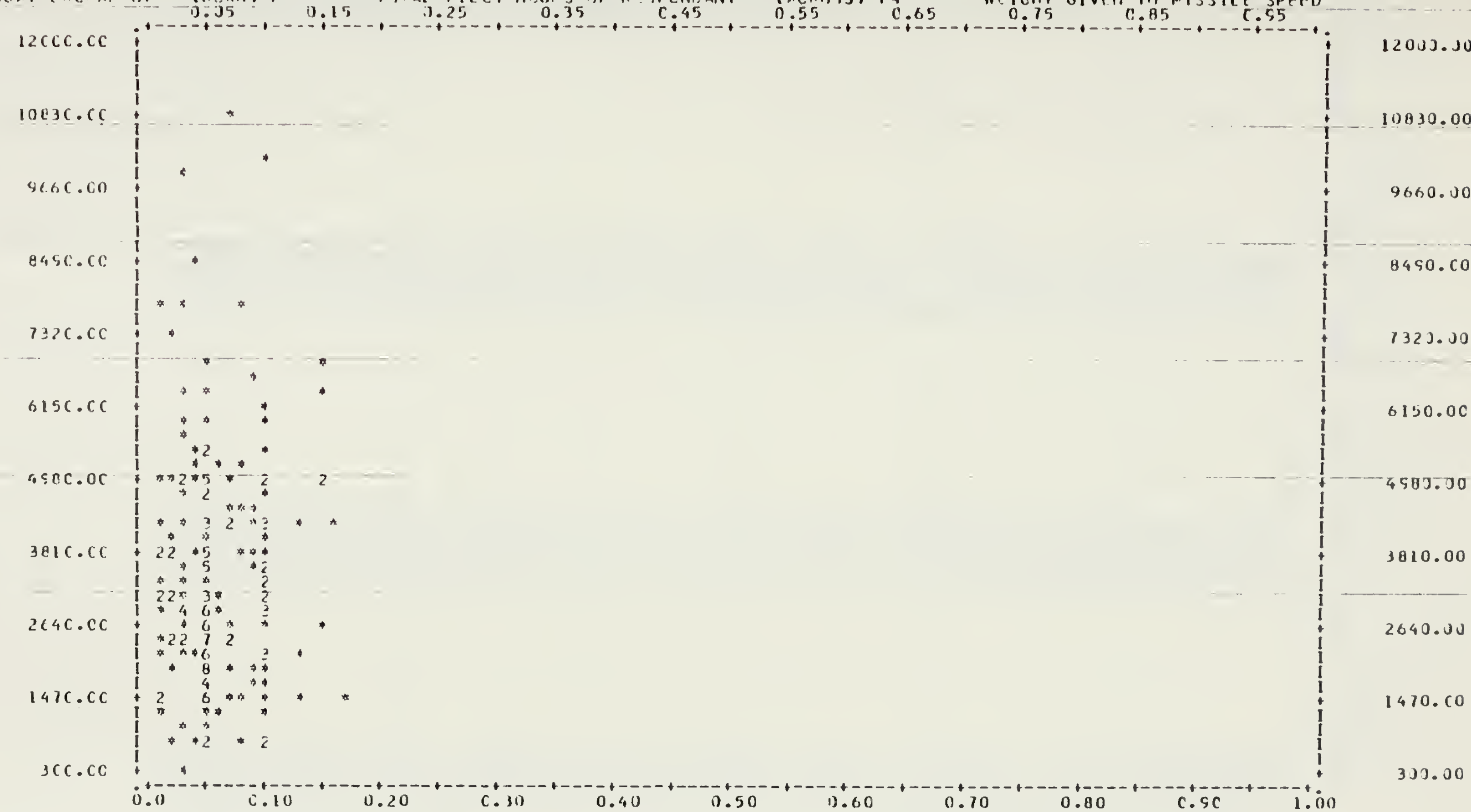
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY

SCATTERGRAM OF (DOWN) P TOTAL PILOT HOURS OF RESPONDANT (ACROSS) F4 WEIGHT GIVEN TO MISSILE SPEED



STATISTICS..

CORRELATION (R)-	0.06512	R SQUARED -	0.00424	SIGNIFICANCE -	0.18039
STD ERR OF EST -	1808.19211	INTERCEPT (A) -	3336.63654	SLOPE (B) -	3508.24481
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0

FACTOR: MISSILE ANGLE-OFF CAPABILITY (DEGREES)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
1	90.0	180.0	360.0	0.050
2	90.0	135.0	180.0	0.040
3	45.0	90.0	180.0	0.050
4	45.0	90.0	125.0	0.100
5	90.0	90.0	180.0	0.100
6	30.0	35.0	90.0	0.050
7	90.0	90.0	90.0	0.050
8	30.0	45.0	180.0	0.020
9	5.0	10.0	45.0	0.030
10	30.0	40.0	45.0	0.150
11	0.0	45.0	60.0	0.080
12	45.0	45.0	60.0	0.100
13	20.0	45.0	360.0	0.100
14	360.0	360.0	360.0	0.050
15	0.0	10.0	30.0	0.050
16	15.0	15.0	90.0	0.050
17	30.0	270.0	360.0	0.050
18	15.0	20.0	30.0	0.050
19	20.0	45.0	50.0	0.100
20	60.0	90.0	180.0	0.050
21	360.0	360.0	360.0	0.050
22	60.0	70.0	90.0	0.100
23	45.0	60.0	90.0	0.100
24	360.0	360.0	360.0	0.067
25	360.0	360.0	360.0	0.100
26	60.0	65.0	120.0	0.100
27	45.0	35.0	90.0	0.100
28	180.0	80.0	180.0	0.150
29	20.0	30.0	45.0	0.040
30	360.0	360.0	360.0	0.120
31	15.0	25.0	45.0	0.040
32	30.0	80.0	120.0	0.050
33	15.0	30.0	75.0	0.090
34	60.0	90.0	360.0	0.050
35	80.0	150.0	180.0	0.090
36	90.0	150.0	180.0	0.050
37	30.0	45.0	60.0	0.050
38	30.0	31.0	50.0	0.100
39	0.0	30.0	45.0	0.010
40	360.0	360.0	360.0	0.125
41	15.0	30.0	90.0	0.083
42	30.0	60.0	90.0	0.100
43	60.0	120.0	180.0	0.030
44	30.0	180.0	360.0	0.050
45	20.0	25.0	40.0	0.035
46	0.0	45.0	60.0	0.050
47	60.0	75.0	90.0	0.020
48	10.0	15.0	45.0	0.120
49	30.0	35.0	180.0	0.500
50	60.0	90.0	150.0	0.035

FACTOR: MISSILE ANGLE-OFF CAPABILITY (DEGREES)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
51	90.0	180.0	360.0	0.025
52	45.0	50.0	90.0	0.050
53	90.0	110.0	180.0	0.050
54	60.0	70.0	120.0	0.050
55	20.0	60.0	90.0	0.100
56	30.0	50.0	70.0	0.190
57	150.0	160.0	360.0	0.075
58	45.0	180.0	360.0	0.050
59	60.0	80.0	120.0	0.075
60	30.0	45.0	90.0	0.075
61	30.0	40.0	90.0	0.050
62	60.0	75.0	90.0	0.100
63	30.0	40.0	90.0	0.100
64	360.0	360.0	360.0	0.100
65	60.0	90.0	120.0	0.100
66	360.0	360.0	360.0	0.075
67	60.0	90.0	360.0	0.050
68	0.0	60.0	90.0	0.050
69	135.0	360.0	360.0	0.050
70	40.0	40.0	60.0	0.020
71	45.0	60.0	90.0	0.075
72	20.0	45.0	60.0	0.075
73	0.0	75.0	180.0	0.030
74	40.0	60.0	90.0	0.200
75	60.0	95.0	180.0	0.110
76	20.0	45.0	180.0	0.050
77	45.0	60.0	180.0	0.050
78	90.0	135.0	180.0	0.100
79	360.0	360.0	360.0	0.050
80	60.0	62.0	90.0	0.020
81	45.0	50.0	90.0	0.050
82	30.0	45.0	60.0	0.050
83	20.0	25.0	30.0	0.100
84	360.0	360.0	360.0	0.075
85	20.0	30.0	90.0	0.100
86	90.0	100.0	360.0	0.100
87	45.0	46.0	90.0	0.020
88	15.0	45.0	180.0	0.030
89	20.0	45.0	60.0	0.150
90	20.0	40.0	360.0	0.100
91	45.0	90.0	360.0	0.050
92	0.0	35.0	45.0	0.050
93	5.0	15.0	30.0	0.050
94	30.0	45.0	90.0	0.125
95	60.0	120.0	360.0	0.100
96	90.0	90.0	180.0	0.050
97	360.0	360.0	360.0	0.065
98	45.0	60.0	90.0	0.050
99	60.0	90.0	180.0	0.050
100	15.0	25.0	40.0	0.050

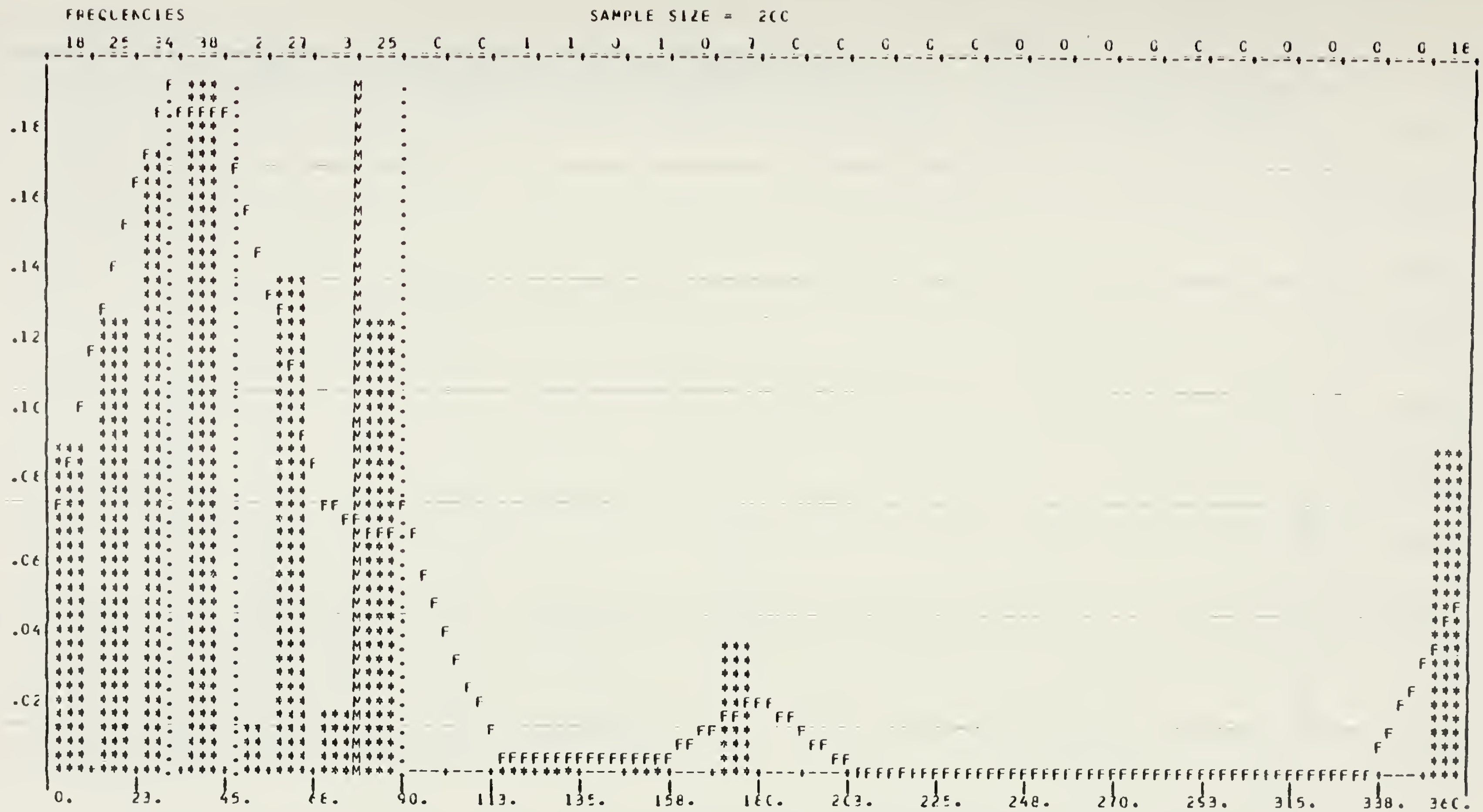
FACTOR: MISSILE ANGLE-OFF CAPABILITY (DEGREES)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
101	180.0	180.0	180.0	0.080
102	10.0	30.0	45.0	0.010
103	45.0	90.0	360.0	0.075
104	40.0	60.0	180.0	0.070
105	15.0	40.0	60.0	0.040
106	180.0	180.0	180.0	0.050
107	360.0	360.0	360.0	0.050
108	30.0	90.0	180.0	0.050
109	70.0	80.0	90.0	0.100
110	40.0	40.0	60.0	0.050
111	90.0	110.0	180.0	0.150
112	45.0	90.0	180.0	0.050
113	45.0	65.0	90.0	0.075
114	360.0	360.0	360.0	0.075
115	40.0	135.0	180.0	0.150
116	60.0	90.0	180.0	0.100
117	0.0	40.0	50.0	0.075
118	90.0	135.0	180.0	0.050
119	45.0	60.0	360.0	0.325
120	25.0	40.0	50.0	0.095
121	90.0	90.0	180.0	0.160
122	20.0	90.0	180.0	0.080
123	50.0	50.0	180.0	0.090
124	90.0	90.0	360.0	0.100
125	60.0	70.0	95.0	0.050
126	40.0	60.0	80.0	0.050
127	0.0	40.0	65.0	0.030
128	45.0	90.0	180.0	0.020
129	30.0	45.0	90.0	0.025
130	30.0	45.0	60.0	0.050
131	30.0	30.0	360.0	0.050
132	20.0	60.0	180.0	0.100
133	30.0	60.0	90.0	0.100
134	180.0	360.0	360.0	0.010
135	30.0	45.0	90.0	0.100
136	30.0	35.0	45.0	0.050
137	60.0	60.0	90.0	0.050
138	0.0	40.0	90.0	0.050
139	180.0	180.0	180.0	0.050
140	30.0	45.0	90.0	0.100
141	360.0	360.0	360.0	0.100
142	90.0	180.0	360.0	0.050
143	120.0	180.0	360.0	0.070
144	40.0	45.0	180.0	0.075
145	180.0	200.0	360.0	0.050
146	70.0	270.0	360.0	0.100
147	45.0	90.0	180.0	0.050
148	20.0	20.0	30.0	0.050
149	60.0	180.0	360.0	0.050
150	30.0	45.0	360.0	0.050

FACTOR: MISSILE ANGLE-OFF CAPABILITY (DEGREES)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
151	30.0	45.0	60.0	0.020
152	180.0	360.0	360.0	0.110
153	45.0	60.0	90.0	0.100
154	90.0	180.0	360.0	0.050
155	45.0	45.0	90.0	0.100
156	20.0	30.0	90.0	0.095
157	50.0	135.0	360.0	0.040
158	360.0	360.0	360.0	0.030
159	20.0	35.0	60.0	0.050
160	5.0	20.0	90.0	0.150
161	60.0	80.0	120.0	0.050
162	45.0	60.0	135.0	0.060
163	40.0	60.0	360.0	0.075
164	30.0	45.0	60.0	0.050
165	40.0	50.0	90.0	0.100
166	360.0	360.0	360.0	0.100
167	45.0	180.0	360.0	0.075
168	60.0	90.0	180.0	0.050
169	10.0	60.0	90.0	0.050
170	90.0	180.0	360.0	0.025
171	360.0	360.0	360.0	0.090
172	90.0	100.0	135.0	0.475
173	45.0	90.0	360.0	0.080
174	30.0	45.0	180.0	0.050
175	90.0	135.0	180.0	0.075
176	60.0	90.0	360.0	0.100
177	90.0	135.0	180.0	0.100
178	45.0	90.0	120.0	0.030
179	45.0	90.0	180.0	0.110
180	30.0	70.0	100.0	0.100
181	90.0	90.0	90.0	0.150
182	30.0	60.0	90.0	0.125
183	60.0	90.0	90.0	0.150
184	45.0	60.0	180.0	0.020
185	70.0	135.0	360.0	0.040
186	60.0	80.0	360.0	0.075
187	15.0	30.0	90.0	0.050
188	90.0	90.0	180.0	0.100
189	66.0	360.0	360.0	0.050
190	90.0	150.0	180.0	0.050
191	45.0	90.0	360.0	0.050
192	0.0	120.0	180.0	0.050
193	10.0	30.0	45.0	0.100
194	30.0	50.0	360.0	0.050
195	360.0	360.0	360.0	0.050
196	30.0	45.0	60.0	0.050
197	40.0	40.0	180.0	0.030
198	90.0	100.0	135.0	0.030
199	60.0	60.0	360.0	0.030
200	30.0	60.0	120.0	0.100

SAMPLE SIZE = 200



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	7.753000E 01	VARIANCE	9.260926E 03	M3	2.009010E 06	MINIMUM	0.0
MEDIAN	4.500000E 01	STD DEV	9.623370E 01	M4	5.916992E 08	.10 QUANTILE	1.500000E 01
TRIMEAN	5.250000E 01	COEF VAR	1.241244E 00	SKEWNESS	2.254242E 00	.25 QUANTILE (HINGE)	3.000000E 01
MIDMEAN	4.669999E 01	MEAN DEV	5.242999E 01	KURTOSIS	3.909962E 00	.50 QUANTILE (MEDIAN)	4.500000E 01
MIDRANGE	1.800000E 02	RANGE	3.600000E 02	BETA1	1.979976E 00	.75 QUANTILE (HINGE)	9.000000E 01
		MIDSPREAD	6.000000E 01	BETA2	5.629761E 00	.90 QUANTILE	1.800000E 02
						MAXIMUM	3.600000E 02

LOWER LIMIT FOR MISSILE ANGLE OFF CAPABILITY

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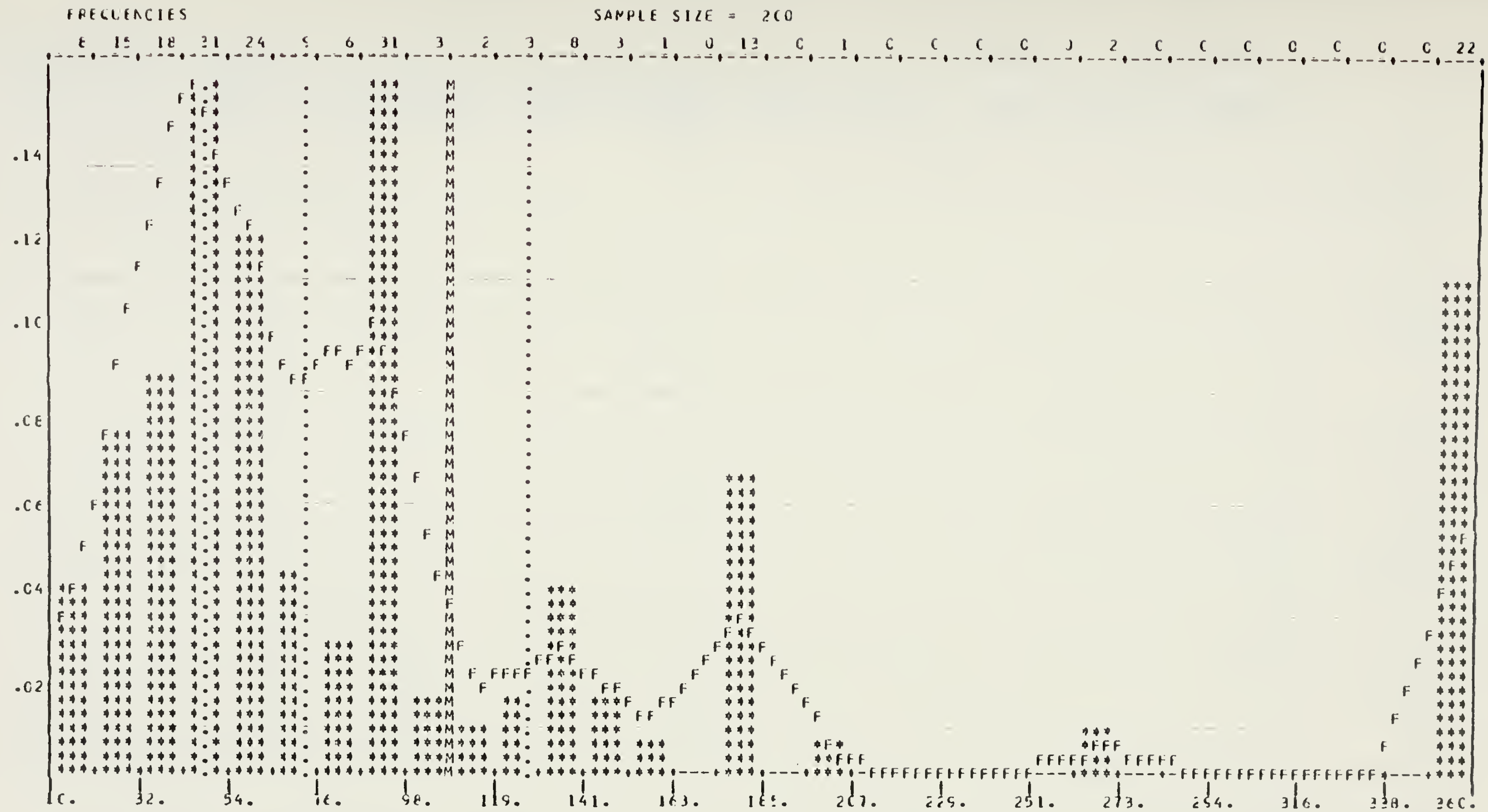
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY

SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) G1 LOWER LIMIT FOR MISSILE ANGLE OF

STATISTICS..

CORRELATION (R)-	0.03750	R SQUARED -	0.00141	SIGNIFICANCE -	0.29947
STD ERR OF EST -	1810.76395	INTERCEPT (A) -	3489.08820	SLOPE (B) -	0.70283
PLOTTED VALUES -	159	EXCLUDED VALUES-	1	MISSING VALUES -	0



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.075450E 02	VARIANCE	1.001204E 04	M3	1.706595E 06	MINIMUM	1.000000E 01
MEDIAN	7.000000E 01	STD DEV	1.000602E 02	M4	4.706354E 08	.10 QUANTILE	3.000000E 01
TRIMEAN	7.812500E 01	COEF VAR	9.269553E-01	SKEWNESS	1.703511E 00	.25 QUANTILE (HINGE)	4.500000E 01
MIDMEAN	7.255459E 01	MEAN DEV	6.415500E 01	KURTOSIS	1.695082E 00	.50 QUANTILE (MEDIAN)	7.000000E 01
MIDRANGE	1.850000E 02	RANGE	3.500000E 02	BETA1	1.681076E 06	.75 QUANTILE (HINGE)	1.275000E 02
GEOM MEAN	7.711154E 01	MIDSPREAD	8.250000E 01	BETA2	4.642115E 08	.90 QUANTILE	3.600000E 02
HARM MEAN	5.155428E 01					MAXIMUM	3.600000E 02

FIFTIETH %TILE FOR MISSILE ANGLE OFF CAPABILITY

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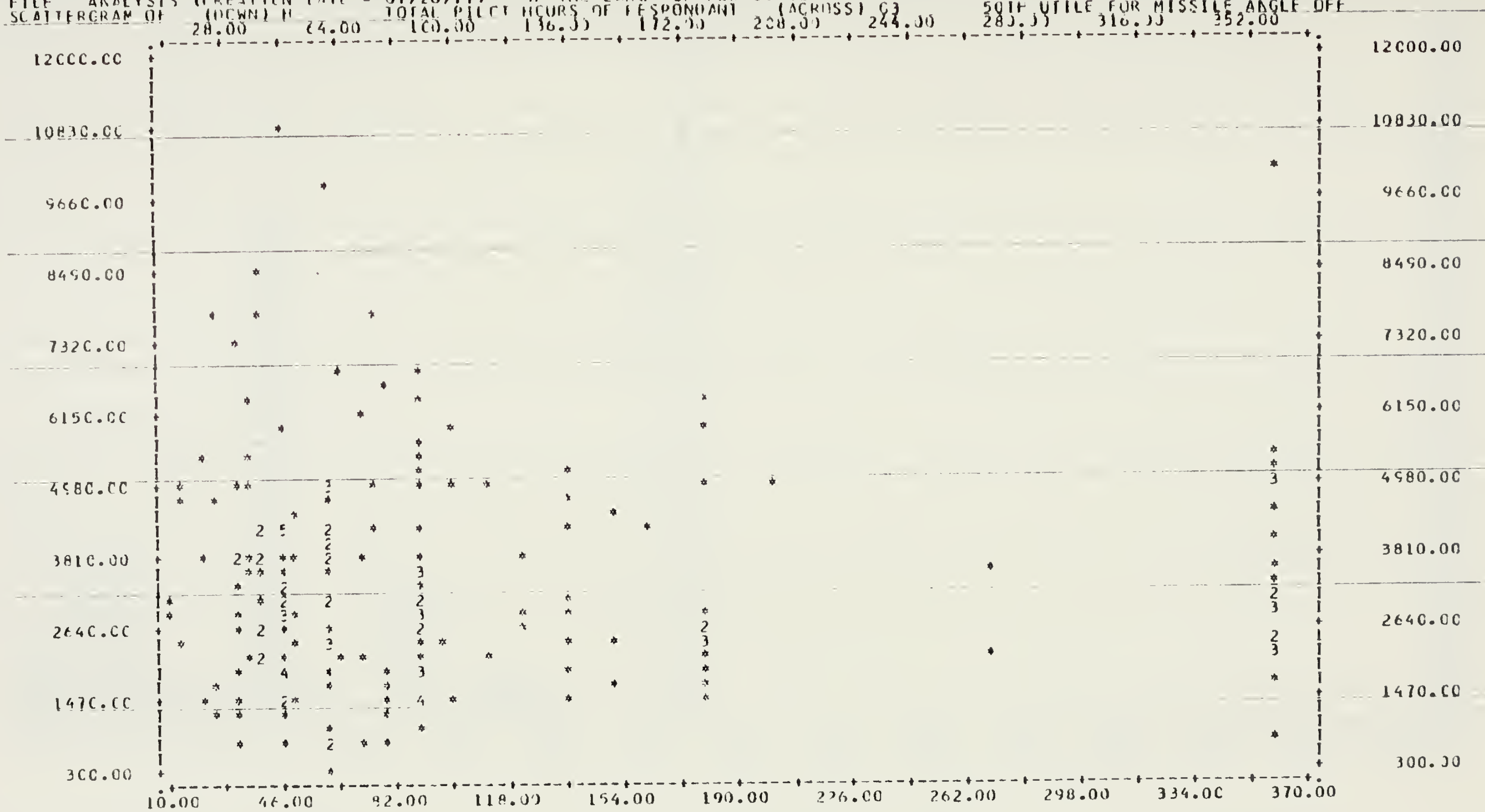
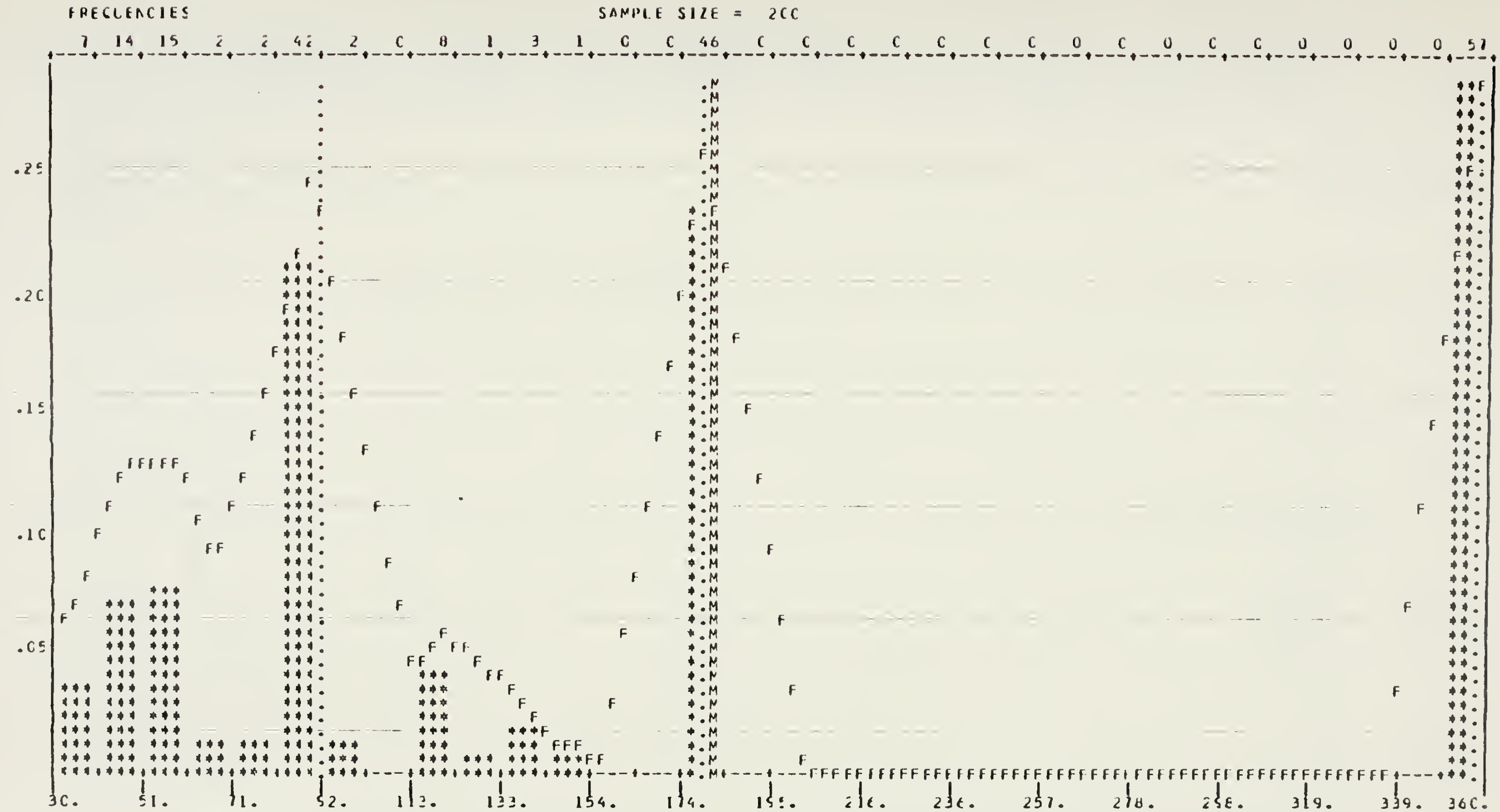
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) C3 50TH UTILE FOR MISSILE ANGLE OFF



STATISTICS..

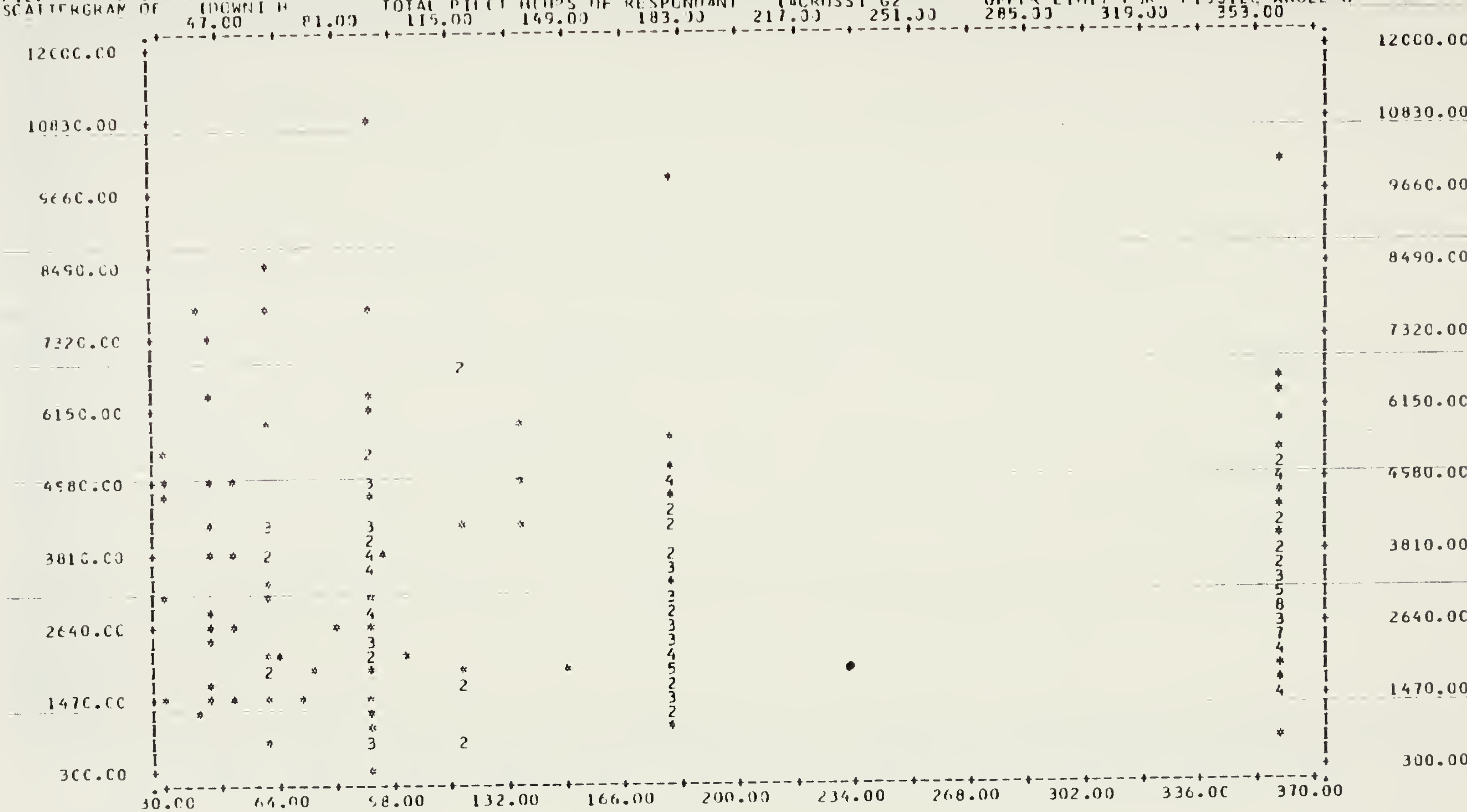
CORRELATION (R)-	0.00886	R SQUARED -	0.00008	SIGNIFICANCE -	0.45059
STD ERR OF EST -	1811.96767	INTERCEPT (A) -	3526.44865	SLOPE (B) -	0.15962
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.824250E 02	VARIANCE	1.458366E 04	M3	9.678950E 05	MINIMUM	3.000000E 01
MEDIAN	1.800000E 02	STD DEV	1.207628E 02	M4	3.622917E 08	.10 QUANTILE	5.000000E 01
TRIMEAN	2.025000E 02	COEF VAR	6.619862E-01	SKEWNESS	5.495768E-01	.25 QUANTILE (HINGE)	9.000000E 01
MIDMEAN	1.551500E 02	MEAN DEV	1.001750E 02	KURTOSIS	-1.296566E 00	.50 QUANTILE (MEDIAN)	1.800000E 02
MIDRANGE	1.950000E 02	RANGE	3.300000E 02	BETA1	9.534251E 05	.75 QUANTILE (HINGE)	3.600000E 02
GEOM MEAN	1.426120E 02	MIDSPREAD	2.700000E 02	BETA2	3.613786E 08	.90 QUANTILE	3.600000E 02
HARM MEAN	1.093476E 02					MAXIMUM	3.600000E 02

UPPER LIMIT FOR MISSILE ANGLE OFF CAPABILITY

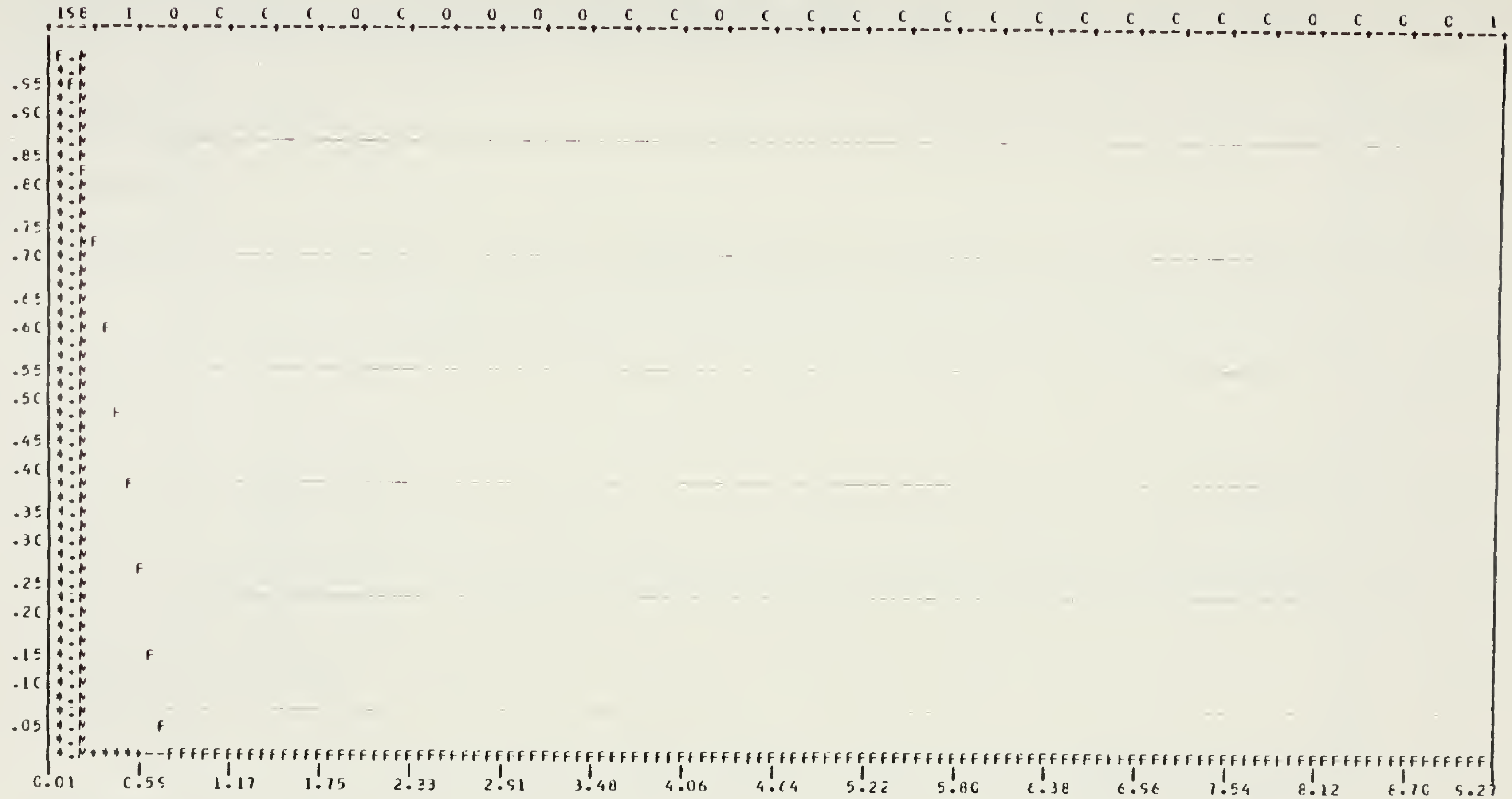
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) G2 UPPER LIMIT FOR MISSILE ANGLE 0



STATISTICS..

CORRELATION (R)-	-0.04381	R SQUARED -	0.00192	SIGNIFICANCE -	0.26945
STD ERR OF EST -	1810.25865	INTERCEPT (A) -	3663.27806	SLOPE (B) -	-0.65449
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0

FREQUENCIES SAMPLE SIZE = 200



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.403300E-01	VARIANCE	4.236972E-01	M3	3.666591E 00	MINIMUM	9.999998E-03
MEDIAN	9.999996E-02	STD DEV	6.509203E-01	M4	3.551179E 01	.10 QUANTILE	3.300000E-02
TRIMEAN	9.374994E-02	COEF VAR	4.638458E 00	SKEWNESS	1.402715E 01	.25 QUANTILE (HINGE)	4.999998E-02
MIDMEAN	9.072995E-02	MEAN DEV	8.131993E-02	KURTOSIS	1.546505E 02	.50 QUANTILE (MEDIAN)	9.999996E-02
MIDRANGE	4.642499E 00	RANGE	9.264999E 00	BETA1	3.810757E 00	.75 QUANTILE (HINGE)	1.250000E-01
GEOM MEAN	8.278500E-02	MIDSPREAD	7.499999E-02	BETA2	3.481300E 01	.90 QUANTILE	1.500000E-01
HARM MEAN	6.420553E-02					MAXIMUM	9.275000E 00

WEIGHT GIVEN TO MISSILE ANGLE OFF CAPABILITY

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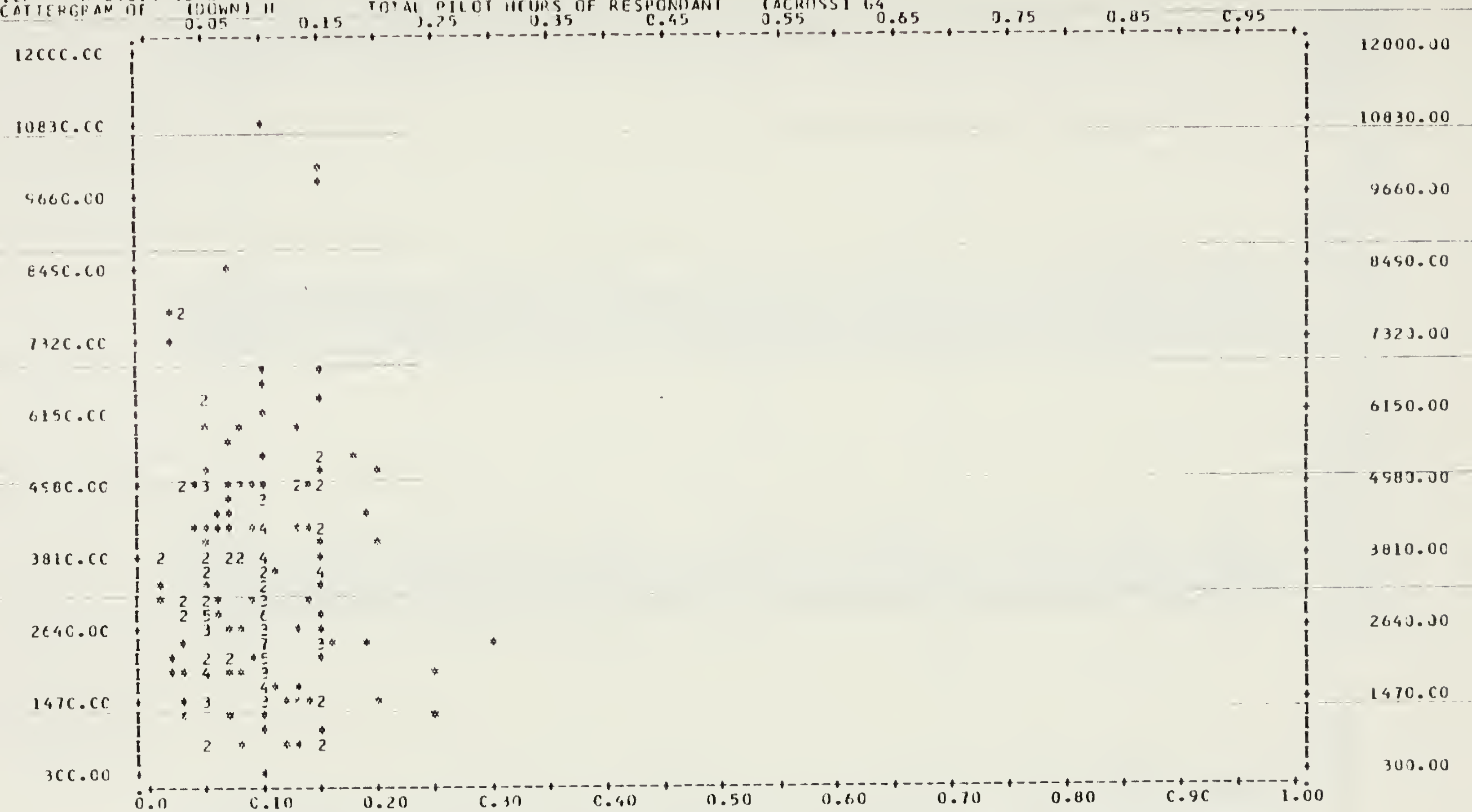
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) 64



STATISTICS..

CORRELATION (R)-	-0.04062	R SQUARED -	0.00165	SIGNIFICANCE -	0.28495
STD ERR OF EST -	1812.60620	INTERCEPT (A) -	3654.97633	SLOPE (B) -	-1530.70031
PLOTTED VALUES -	158	EXCLUDED VALUES-	2	MISSING VALUES -	0

FACTOR: MISSILE RANGE (NAUTICAL MILES)

RESPONDANT	LOWER LIMIT	FIFTIETH UTILE	UPPER LIMIT	WEIGHT
1	1.00	6.00	10.00	0.125
2	10.00	20.00	30.00	0.500
3	3.00	10.00	50.00	0.500
4	30.00	87.50	90.00	0.200
5	0.25	1.00	0.50	0.100
6	3.00	5.00	20.00	0.150
7	30.00	60.00	150.00	0.150
8	1.00	5.00	20.00	0.500
9	0.50	1.00	45.00	0.250
10	10.00	11.00	19.00	0.100
11	4.00	13.00	16.00	0.190
12	3.00	10.00	25.00	0.150
13	0.15	10.00	20.00	0.200
14	3.00	6.00	20.00	0.300
15	0.10	2.00	5.00	0.500
16	2.00	3.00	10.00	0.250
17	10.00	25.00	100.00	0.250
18	20.00	30.00	50.00	0.250
19	6.00	20.00	30.00	0.050
20	0.50	3.00	5.00	0.350
21	25.00	25.00	30.00	0.300
22	10.00	20.00	50.00	0.250
23	0.25	1.00	10.00	0.250
24	0.25	10.00	20.00	0.200
25	6.00	10.00	20.00	0.500
26	20.00	25.00	70.00	0.300
27	0.50	3.00	5.00	0.100
28	0.60	5.00	150.00	0.150
29	2.00	3.00	5.00	0.500
30	15.00	18.00	30.00	0.350
31	10.00	15.00	25.00	0.190
32	2.00	30.00	50.00	0.150
33	3.00	6.00	15.00	0.250
34	5.00	10.00	20.00	0.400
35	0.20	25.00	40.00	0.100
36	10.00	13.00	15.00	0.250
37	10.00	11.00	15.00	0.450
38	1.00	19.00	20.00	0.050
39	1.00	15.00	50.00	0.600
40	5.00	25.00	40.00	0.100
41	0.10	2.00	10.00	0.240
42	20.00	40.00	50.00	0.050
43	0.15	20.00	0.40	0.500
44	2.00	15.00	20.00	0.150
45	0.50	4.00	10.00	0.300
46	1.00	8.00	10.00	0.400
47	20.00	25.00	40.00	0.400
48	2.00	10.00	40.00	0.250
49	0.50	3.00	8.00	0.100
50	2.00	100.00	5.00	0.200

FACTOR: MISSILE RANGE (NAUTICAL MILES)

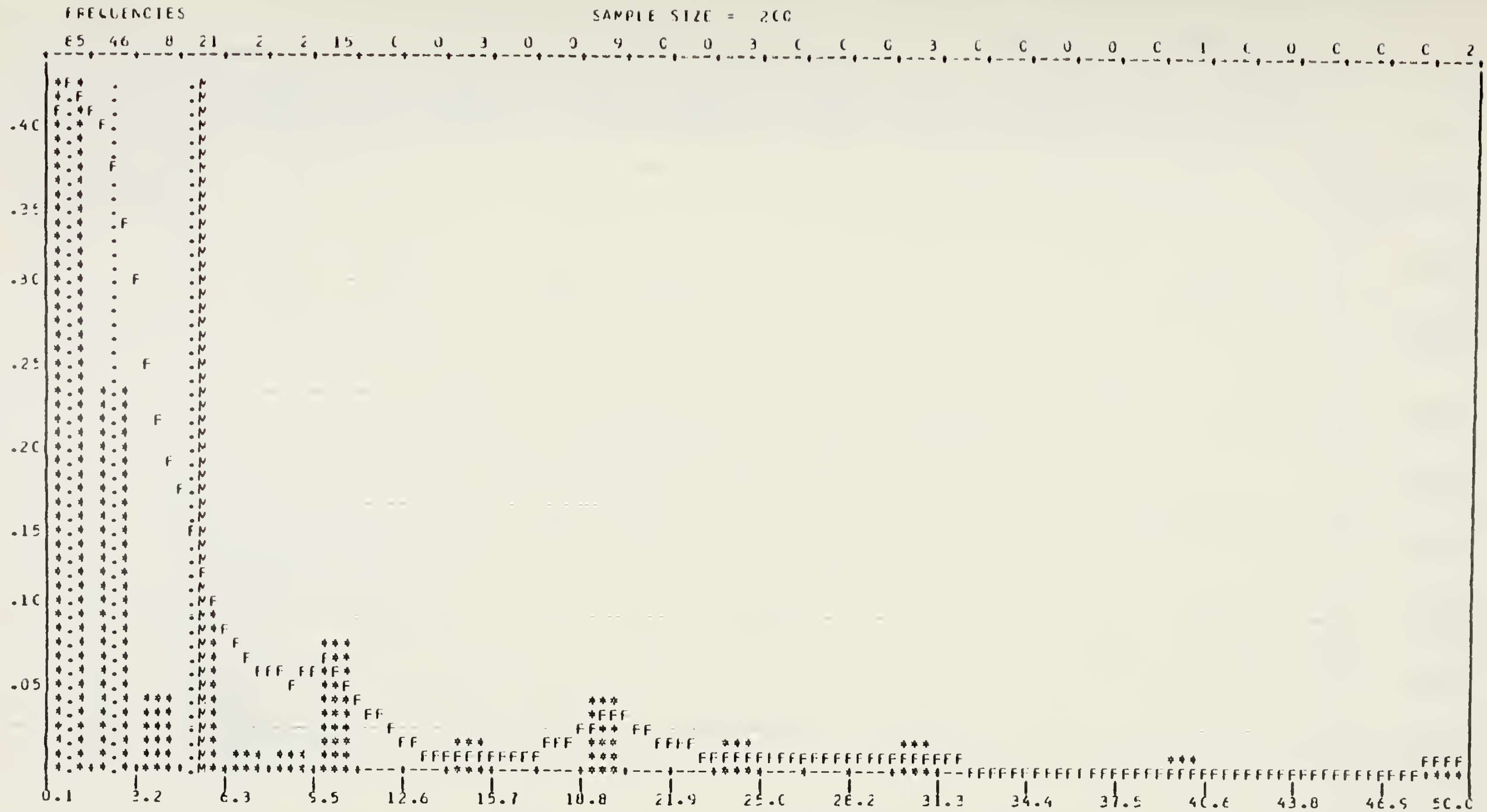
RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
51	6.00	9.00	10.00	0.500
52	5.00	6.00	10.00	0.100
53	5.00	7.00	10.00	0.350
54	1.00	1.50	3.00	0.250
55	0.50	3.00	6.00	0.250
56	1.00	7.00	15.00	0.080
57	5.00	30.00	40.00	0.250
58	0.20	15.00	20.00	0.300
59	5.00	20.00	100.00	0.125
60	3.00	5.00	50.00	0.350
61	3.00	20.00	50.00	0.250
62	3.00	5.00	7.00	0.050
63	0.30	40.00	50.00	0.600
64	0.15	25.00	50.00	0.100
65	2.00	4.00	5.00	0.050
66	3.50	6.00	14.00	0.200
67	2.00	8.00	10.00	0.100
68	1.00	30.00	100.00	0.190
69	50.00	100.00	150.00	0.050
70	0.25	10.00	25.00	0.025
71	0.50	35.00	100.00	0.100
72	1.00	3.00	10.00	0.200
73	5.00	7.00	30.00	0.400
74	3.00	5.00	8.00	0.150
75	5.00	20.00	50.00	0.090
76	2.00	1.00	15.00	0.200
77	4.00	7.00	60.00	0.200
78	1.00	3.00	5.00	0.250
79	0.20	15.00	28.00	0.250
80	15.00	25.00	35.00	0.300
81	7.00	6.00	15.00	0.300
82	2.00	4.00	50.00	0.250
83	2.00	8.00	15.00	0.300
84	3.00	7.00	9.00	0.025
85	5.00	20.00	30.00	0.150
86	2.00	5.00	50.00	0.100
87	2.50	25.00	5.00	0.100
88	1.00	4.00	20.00	0.215
89	5.00	25.00	50.00	0.150
90	0.33	5.00	15.00	0.200
91	0.25	20.00	35.00	0.075
92	0.40	3.00	5.00	0.100
93	1.00	2.00	5.00	0.500
94	3.00	20.00	100.00	0.100
95	0.20	0.40	7.00	0.200
96	3.00	15.00	30.00	0.450
97	0.30	8.00	20.00	0.375
98	10.00	25.00	50.00	0.0
99	2.00	5.00	75.00	0.200
100	3.00	5.00	10.00	0.500

FACTOR: MISSILE RANGE (NAUTICAL MILES)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
101	20.00	25.00	50.00	0.500
102	0.10	10.00	20.00	0.400
103	0.60	5.00	10.00	0.250
104	0.50	3.00	4.00	0.250
105	2.00	15.00	30.00	0.300
106	25.00	30.00	35.00	0.500
107	4.00	5.00	6.00	0.500
108	10.00	35.00	80.00	0.350
109	5.00	15.00	20.00	0.100
110	2.00	3.00	10.00	0.200
111	8.00	14.00	45.00	0.125
112	4.00	10.00	25.00	0.250
113	0.10	7.00	20.00	0.110
114	20.00	45.00	60.00	0.200
115	2.00	25.00	50.00	0.080
116	0.20	5.00	8.00	0.100
117	10.00	30.00	35.00	0.200
118	4.00	8.00	15.00	0.300
119	0.20	3.00	12.00	0.325
120	0.40	4.00	20.00	0.350
121	15.00	35.00	80.00	0.160
122	3.00	5.00	15.00	0.200
123	6.00	8.00	20.00	0.100
124	25.00	30.00	50.00	0.250
125	3.00	10.00	25.00	0.200
126	4.00	6.00	8.00	0.150
127	1.00	7.00	10.00	0.390
128	5.00	15.00	25.00	0.500
129	5.00	20.00	25.00	0.450
130	1.00	2.00	2.00	0.100
131	1.00	35.00	50.00	0.250
132	2.00	4.00	10.00	0.250
133	7.00	25.00	40.00	0.200
134	40.00	75.00	80.00	0.010
135	1.00	5.00	10.00	0.200
136	1.00	3.00	10.00	0.285
137	1.00	10.00	25.00	0.200
138	0.50	2.00	25.00	0.200
139	4.00	6.00	20.00	0.125
140	1.00	5.00	20.00	0.500
141	1.00	20.00	50.00	0.250
142	3.00	5.00	30.00	0.450
143	20.00	20.00	40.00	0.600
144	0.50	6.00	20.00	0.400
145	30.00	40.00	60.00	0.350
146	0.10	14.00	20.00	0.200
147	1.50	8.00	15.00	0.500
148	0.50	5.00	15.00	0.010
149	0.10	7.00	30.00	0.400
150	5.00	6.00	15.00	0.350

FACTOR: MISSILE RANGE (NAUTICAL MILES)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
151	1.00	8.00	15.00	0.500
152	20.00	35.00	50.00	0.070
153	10.00	60.00	100.00	0.090
154	10.00	10.00	20.00	0.250
155	50.00	75.00	125.00	0.400
156	1.50	5.00	50.00	0.300
157	3.00	4.00	7.00	0.450
158	0.10	25.00	50.00	0.200
159	0.25	3.00	20.00	0.400
160	1.00	10.00	50.00	0.500
161	3.00	25.00	50.00	0.200
162	0.50	20.00	30.00	0.140
163	8.00	6.00	20.00	0.250
164	1.00	45.00	10.00	0.150
165	10.00	25.00	30.00	0.100
166	0.20	5.00	10.00	0.200
167	0.20	9.00	10.00	0.100
168	2.00	3.00	5.00	0.250
169	1.00	25.00	75.00	0.050
170	10.00	20.00	75.00	0.500
171	2.00	4.00	6.00	0.350
172	6.00	10.00	25.00	0.100
173	2.00	10.00	20.00	0.250
174	3.00	20.00	75.00	0.150
175	2.00	10.00	12.00	0.300
176	0.20	90.00	120.00	0.100
177	0.20	20.00	30.00	0.250
178	2.00	6.00	120.00	0.400
179	3.00	10.00	20.00	0.160
180	2.00	14.00	25.00	0.200
181	0.75	90.00	100.00	0.150
182	0.20	5.00	50.00	0.125
183	1.00	15.00	40.00	0.300
184	5.00	20.00	25.00	0.750
185	0.10	1.00	10.00	0.400
186	0.30	10.00	26.00	0.075
187	0.10	20.00	50.00	0.300
188	0.20	10.00	50.00	0.300
189	5.00	15.00	25.00	0.200
190	0.50	2.00	5.00	0.200
191	1.00	7.00	10.00	0.300
192	0.50	3.00	20.00	0.400
193	2.00	10.00	40.00	0.100
194	1.00	1.00	30.00	0.150
195	10.00	10.00	50.00	0.250
196	0.25	5.00	10.00	0.200
197	20.00	30.00	50.00	0.450
198	2.00	2.50	4.00	0.045
199	1.00	5.00	10.00	0.350
200	0.30	5.00	15.00	0.200



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	5.059150E 00	VARIANCE	6.570218E 01	M3	1.627054E 03	MINIMUM	9.999996E-02
MEDIAN	2.000000E 00	STD DEV	8.105308E 00	M4	6.012154E 04	.10 QUANTILE	2.000000E-01
TRIMEAN	2.375000E 00	COEF VAR	1.602915E 00	SKEWNESS	3.051043E 00	.25 QUANTILE (HINGE)	5.000000E-01
MIDMEAN	2.325499E 00	MEAN DEV	4.280849E 00	KURTOSIS	1.050203E 01	.50 QUANTILE (MEDIAN)	2.000000E 00
MIDRANGE	2.504999E 01	RANGE	4.989999E 01	BETA1	1.602769E 02	.75 QUANTILE (HINGE)	5.000000E 00
GEOM MEAN	1.627504E 00	MIDSPREAD	4.500000E 00	BETA2	5.504752E 04	.90 QUANTILE	1.500000E 01
HARM MEAN	6.460546E-01					MAXIMUM	5.000000E 01

LOWER LIMIT FOR MISSILE RANGE

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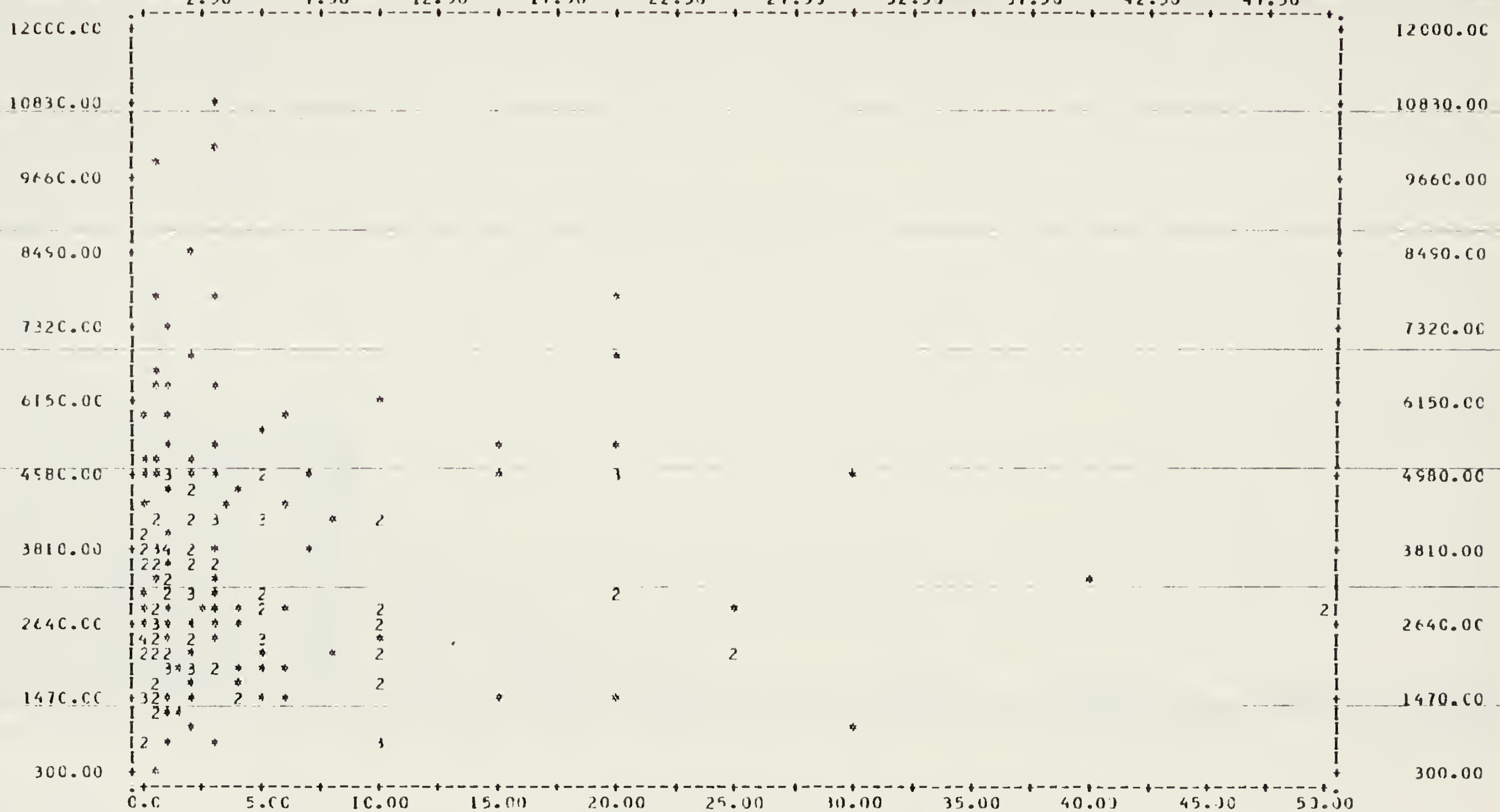
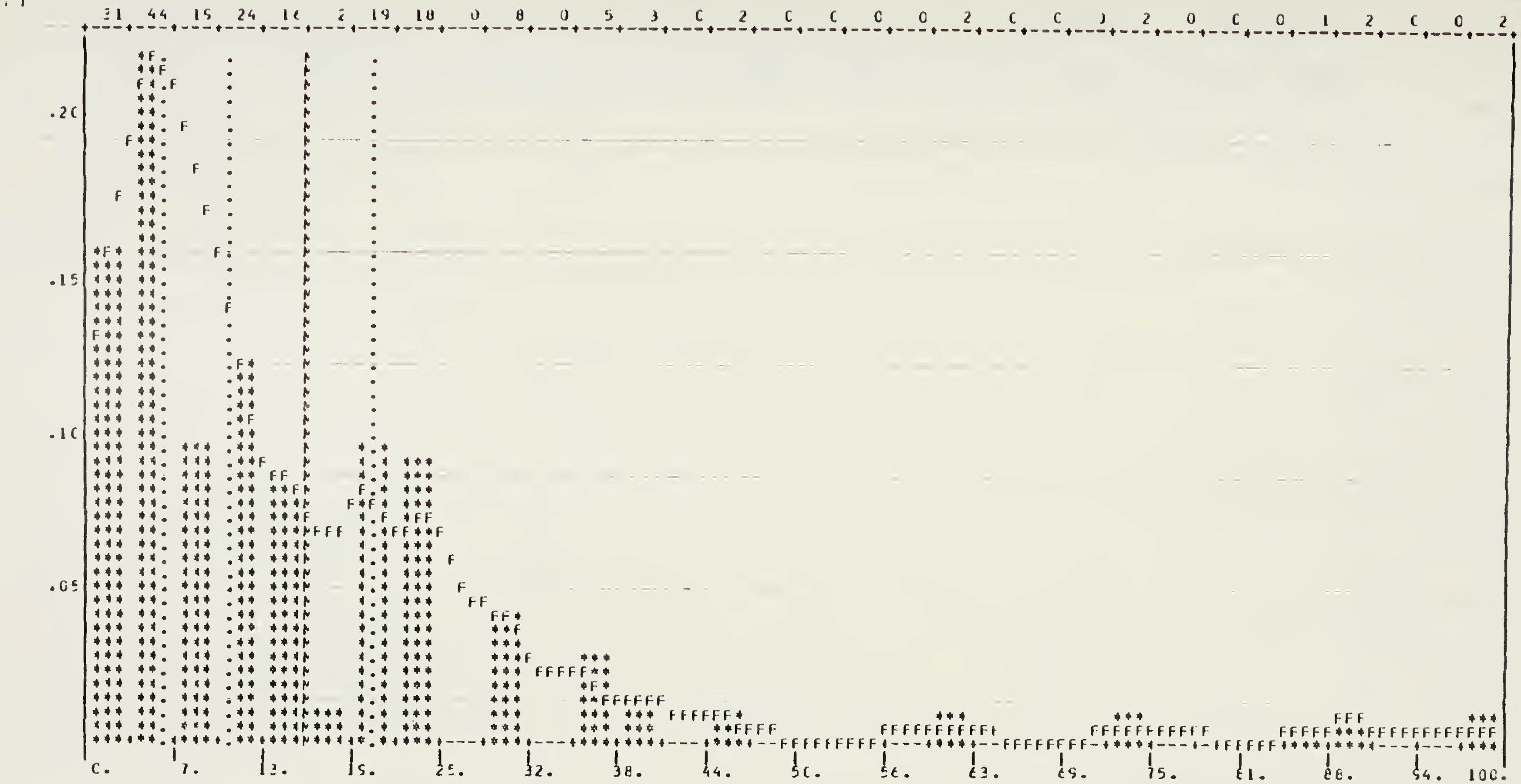
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) H1 LOWER LIMIT FOR MISSILE RANGE



STATISTICS..

CORRELATION (R)-	0.00226	R SQUARED -	0.00001	SIGNIFICANCE -	0.48737
STD ERR OF EST -	1012.03414	INTERCEPT (A) -	3541.15522	SLOPE (B) -	0.51446
PLOTTED VALUES -	159	EXCLUDED VALUES-	1	MISSING VALUES -	0

FREQUENCIES SAMPLE SIZE = 200



CENTRAL TENDENCY	
MEAN	1.571950E 01
MEDIAN	1.000000E 01
TRIMEAN	1.125000E 01
MIDMEAN	1.074000E 01
MIDRANGE	5.020000E 01
GEOM MEAN	9.682138E 00
HARM MEAN	5.656054E 00

SPREAD	
VARIANCE	3.160620E 02
STD DEV	1.777814E 01
COEF VAR	1.130960E 00
MEAN DEV	1.072550E 01
RANGE	9.959999E 01
MIDSPREAD	1.500000E 01

HIGHER CENTRAL MOMENTS	
M3	1.523238E 04
M4	1.150709E 06
SKEWNESS	2.710674E 00
KURTOSIS	8.519163E 00
BETA1	1.500467E 04
BETA2	1.130670E 06

DISTRIBUTION	
MINIMUM	4.000000E-01
.10 QUANTILE	3.000000E 00
.25 QUANTILE (HINGE)	5.000000E 00
.50 QUANTILE (MEDIAN)	1.000000E 01
.75 QUANTILE (HINGE)	2.000000E 01
.90 QUANTILE	3.000000E 01
MAXIMUM	1.000000E 02

FIFTIETH UTILE FOR MISSILE RANGE

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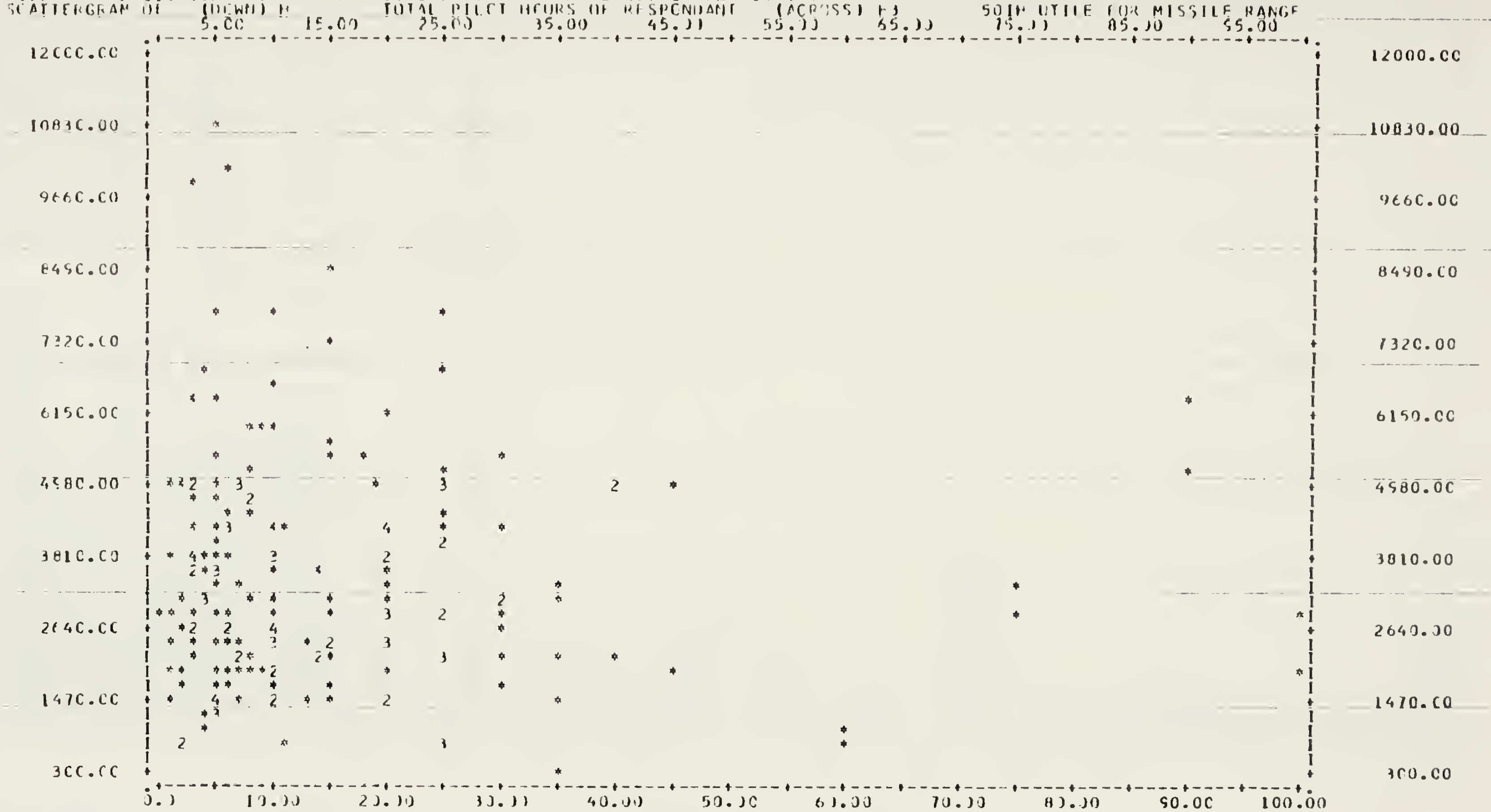
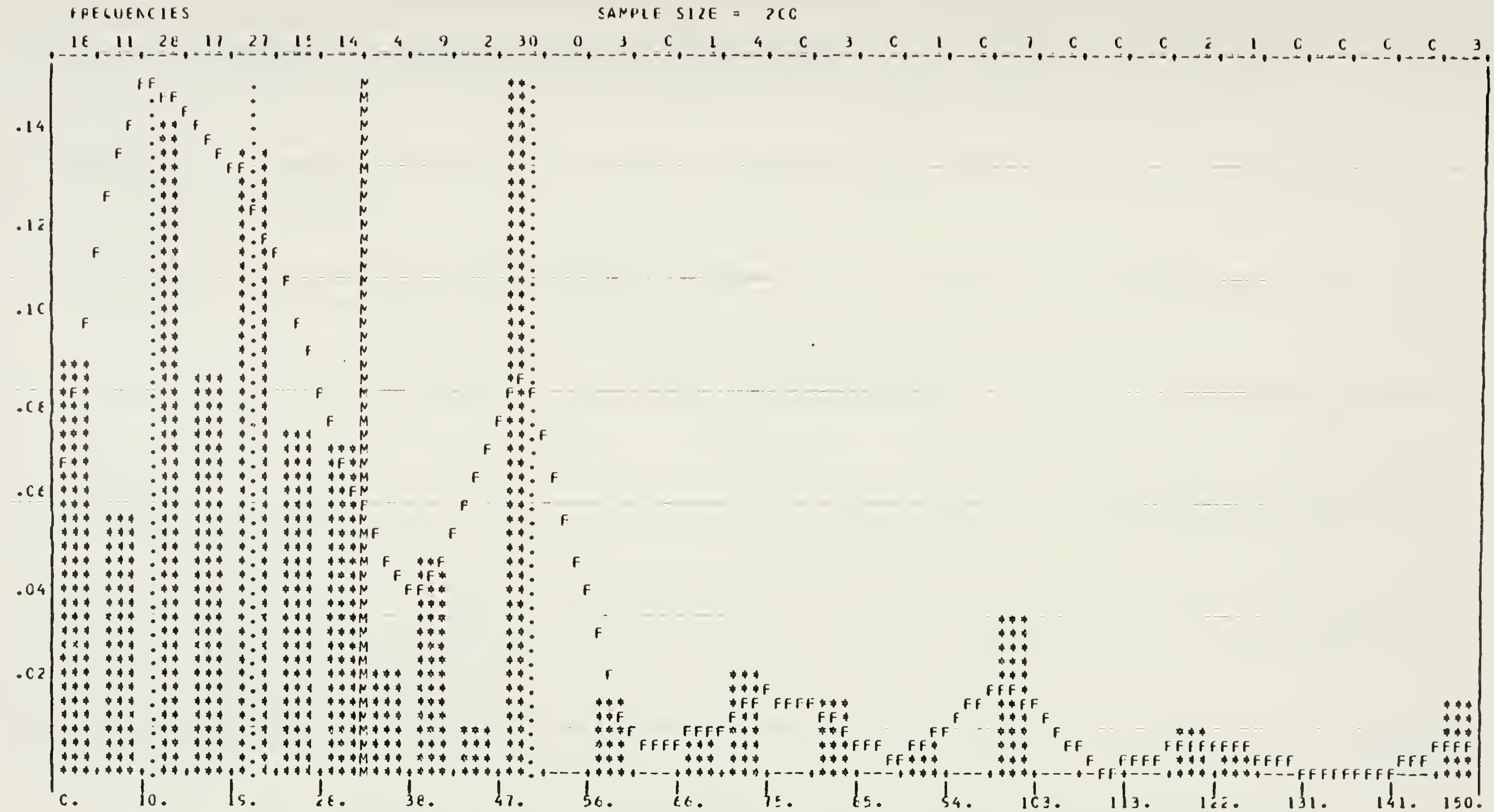
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) F3 50TH UTILE FOR MISSILE RANGE



STATISTICS..

CORRELATION (R)-	-0.02902	R SQUARED -	0.00084	SIGNIFICANCE -	0.34206
STD ERR OF EST -	1811.27576	INTERCEPT (A) -	3550.87273	SLOPE (B) -	-3.07181
PLOTTED VALUES -	159	EXCLUDED VALUES-	1	MISSING VALUES -	0



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	3.262949E 01	VARIANCE	8.730479E 02	M3	4.638350E 04	MINIMUM	4.000000E-01
MEDIAN	2.000000E 01	STD DEV	2.954738E 01	M4	4.947155E 06	.10 QUANTILE	6.000000E 00
TRIMEAN	2.500000E 01	COEF VAR	9.055423E-01	SKEWNESS	1.759086E 00	.25 QUANTILE (HINGE)	1.000000E 01
MIDMEAN	2.517000E 01	MEAN DEV	2.041049E 01	KURTOSIS	3.490577E 00	.50 QUANTILE (MEDIAN)	2.000000E 01
MIDRANGE	7.520000E 01	RANGE	1.496000E 02	BETA1	4.565046E 04	.75 QUANTILE (HINGE)	5.000000E 01
GEOM MEAN	2.151253E 01	MIDSPREAD	4.000000E 01	BETA2	4.870552E 06	.90 QUANTILE	7.500000E 01
HARM MEAN	1.155555E 01					MAXIMUM	1.500000E 02

UPPER LIMIT FOR MISSILE RANGE

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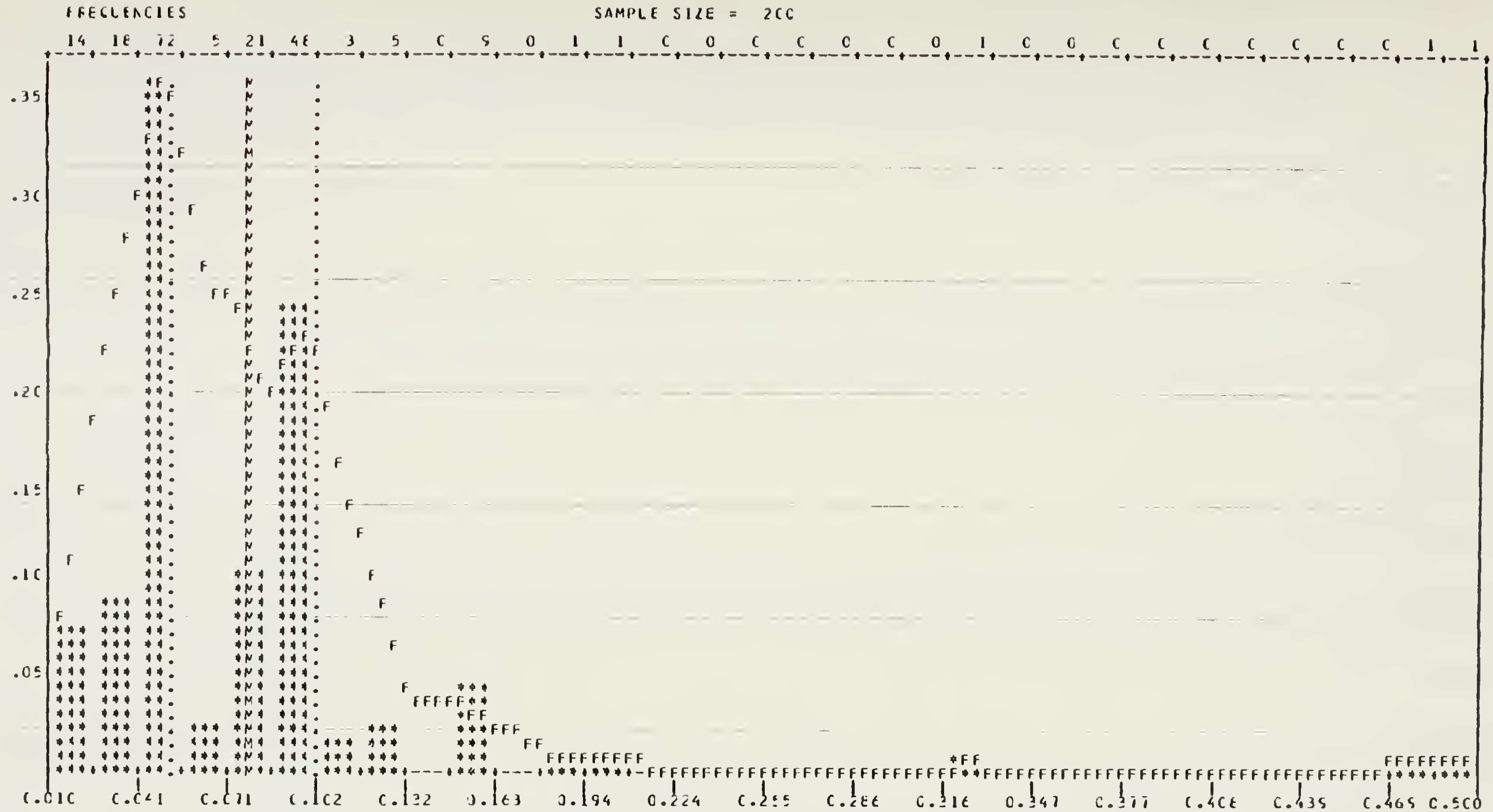
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H UPPER LIMIT FOR MISSILE RANGE (ACROSS) H2 TOTAL PILOT HOURS OF RESPONDANT

STATISTICS..

CORRELATION (R)-	-0.05759	R SQUARED -	0.00332	SIGNIFICANCE -	0.20956
STD ERR OF EST -	1809.03139	INTERCEPT (A) -	3658.43740	SLOPE (B) -	-3.54792
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0



CENTRAL TENDENCY	
MEAN	7.577457E-02
MEDIAN	4.999998E-02
TRIMEAN	6.249997E-02
MIDMEAN	6.584996E-02
MIDRANGE	2.550000E-01
GEOM MEAN	6.234460E-02
HARM MEAN	5.286387E-02

SPREAD	
VARIANCE	3.256445E-03
STD DEV	5.706527E-02
COEF VAR	7.530887E-01
MEAN DEV	3.302499E-02
RANGE	4.899999E-01
MIDSPREAD	4.999998E-02

HIGHER CENTRAL MOMENTS	
M3	8.056625E-04
M4	3.192621E-04
SKEWNESS	4.336559E 00
KURTOSIS	2.710652E 01
BETA1	7.938151E-04
BETA2	3.131535E-04

DISTRIBUTION	
MINIMUM	5.999998E-03
.10 QUANTILE	3.000000E-02
.25 QUANTILE (HINGE)	4.999998E-02
.50 QUANTILE (MEDIAN)	4.999998E-02
.75 QUANTILE (HINGE)	5.999996E-02
.90 QUANTILE	1.100000E-01
MAXIMUM	5.000000E-01

WEIGHT GIVEN TO MISSILE RANGE

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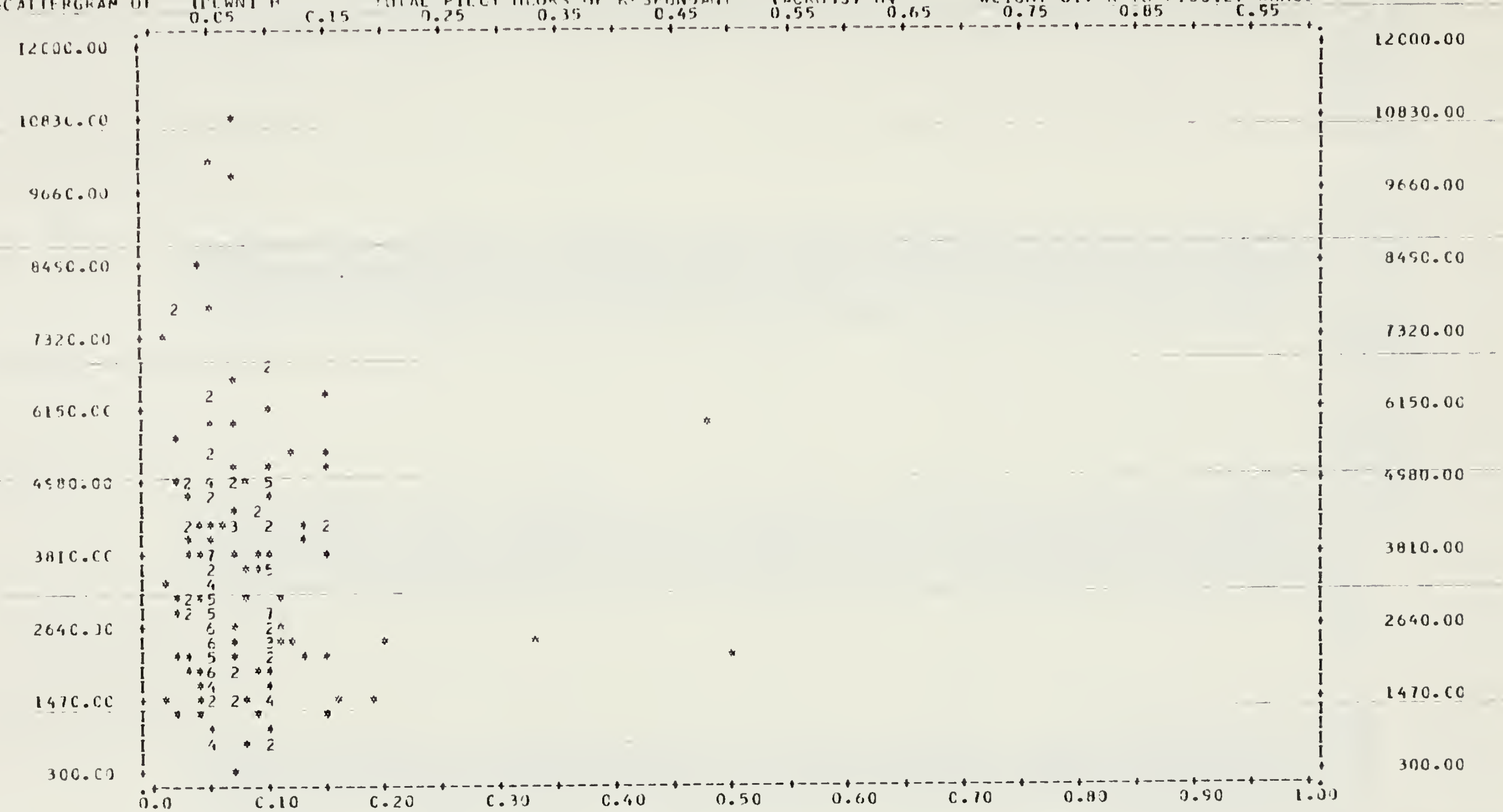
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY

SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) H4 WEIGHT GIVEN TO MISSILE RANGE



STATISTICS..

CORRELATION (R)-	-0.01920	R SQUARED -	0.00037	SIGNIFICANCE -	0.39391
STD ERR OF EST -	1811.73477	INTERCEPT (A) -	3589.63355	SLOPE (B) -	-606.84871
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0

FACTOR: PILOT EXPERIENCE (HOURS)

RESPONDENT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
1	500.0	1000.0	1500.0	0.125
2	500.0	600.0	1000.0	0.060
3	500.0	1000.0	2000.0	0.100
4	750.0	1000.0	1200.0	0.100
5	500.0	800.0	2500.0	0.140
6	500.0	700.0	1200.0	0.150
7	450.0	700.0	1500.0	0.150
8	500.0	1000.0	2000.0	0.030
9	500.0	1000.0	1500.0	0.030
10	250.0	300.0	350.0	0.125
11	500.0	750.0	1200.0	0.120
12	500.0	750.0	1000.0	0.100
13	150.0	400.0	500.0	0.150
14	350.0	400.0	700.0	0.150
15	400.0	500.0	1000.0	0.050
16	250.0	500.0	2000.0	0.100
17	1000.0	1500.0	3000.0	0.100
18	1000.0	1500.0	2500.0	0.100
19	500.0	700.0	1000.0	0.050
20	200.0	600.0	1000.0	0.050
21	500.0	500.0	1000.0	0.100
22	1200.0	1200.0	2500.0	0.100
23	200.0	300.0	1000.0	0.150
24	600.0	800.0	2000.0	0.033
25	600.0	999.0	1000.0	0.100
26	300.0	400.0	1000.0	0.100
27	1000.0	1500.0	2000.0	0.100
28	700.0	710.0	1000.0	0.250
29	500.0	750.0	2000.0	0.010
30	500.0	600.0	900.0	0.180
31	450.0	700.0	1200.0	0.110
32	300.0	300.0	800.0	0.100
33	500.0	1500.0	3000.0	0.020
34	750.0	1000.0	1200.0	0.100
35	400.0	800.0	1500.0	0.190
36	800.0	2200.0	3000.0	0.100
37	200.0	210.0	500.0	0.120
38	300.0	410.0	500.0	0.150
39	500.0	1000.0	200.0	0.020
40	200.0	300.0	500.0	9.275
41	250.0	400.0	1000.0	0.083
42	500.0	650.0	1000.0	0.150
43	400.0	800.0	1000.0	0.075
44	500.0	1200.0	1500.0	0.150
45	175.0	250.0	500.0	0.070
46	350.0	351.0	500.0	0.080
47	500.0	750.0	3000.0	0.020
48	200.0	500.0	1000.0	0.190
49	500.0	750.0	1500.0	0.100
50	600.0	500.0	1200.0	0.080

FACTOR: PILOT EXPERIENCE (HOURS)

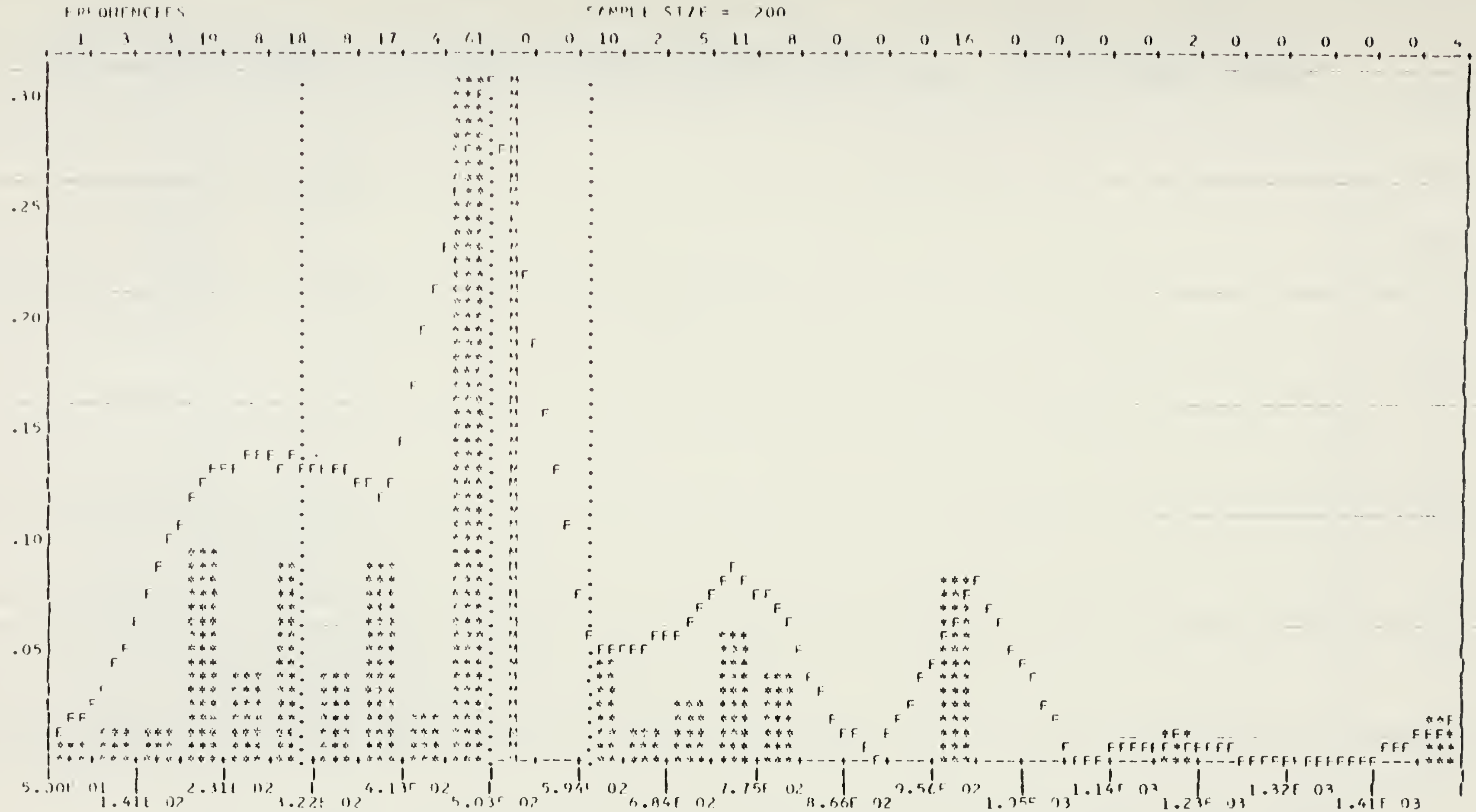
RESPONDANT	LOWER LIMIT	FIFTIETH UTILE	UPPER LIMIT	WEIGHT
51	1000.0	1000.0	1000.0	0.030
52	300.0	500.0	1000.0	0.100
53	100.0	2500.0	5000.0	0.070
54	500.0	600.0	800.0	0.125
55	600.0	601.0	900.0	0.150
56	350.0	500.0	600.0	0.200
57	500.0	750.0	1000.0	0.150
58	200.0	300.0	750.0	0.100
59	650.0	800.0	1750.0	0.075
60	800.0	1000.0	2000.0	0.100
61	300.0	600.0	1100.0	0.050
62	600.0	600.0	1000.0	0.150
63	250.0	300.0	700.0	0.050
64	1000.0	1000.0	3500.0	0.150
65	500.0	1000.0	1500.0	0.150
66	450.0	460.0	1000.0	0.075
67	500.0	750.0	1000.0	0.100
68	400.0	1200.0	3000.0	0.050
69	1000.0	1100.0	2000.0	0.050
70	500.0	800.0	1500.0	0.030
71	250.0	500.0	750.0	0.100
72	500.0	1000.0	3000.0	0.075
73	300.0	1500.0	2500.0	0.030
74	400.0	600.0	800.0	0.300
75	200.0	1500.0	2500.0	0.160
76	300.0	2000.0	5000.0	0.050
77	400.0	500.0	750.0	0.050
78	500.0	600.0	750.0	0.100
79	275.0	320.0	370.0	0.150
80	800.0	1000.0	2000.0	0.030
81	600.0	1300.0	2000.0	0.080
82	400.0	1000.0	1500.0	0.100
83	300.0	600.0	1000.0	0.100
84	150.0	225.0	500.0	0.125
85	800.0	2500.0	2950.0	0.150
86	500.0	500.0	1000.0	0.150
87	1000.0	1200.0	3000.0	0.060
88	300.0	500.0	1500.0	0.055
89	50.0	100.0	250.0	0.100
90	300.0	500.0	800.0	0.050
91	500.0	750.0	1500.0	0.050
92	300.0	400.0	600.0	0.050
93	800.0	1300.0	1800.0	0.050
94	200.0	400.0	600.0	0.100
95	500.0	900.0	1200.0	0.100
96	500.0	500.0	1500.0	0.100
97	200.0	400.0	1000.0	0.050
98	200.0	250.0	500.0	0.050
99	750.0	1000.0	2000.0	0.150
100	700.0	1000.0	1200.0	0.025

FACTOR: PILOT EXPERIENCE (HOURS)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
101	400.0	500.0	750.0	0.080
102	350.0	500.0	2000.0	0.030
103	750.0	1500.0	2000.0	0.125
104	1500.0	1000.0	2000.0	0.150
105	200.0	600.0	1500.0	0.070
106	500.0	700.0	1000.0	0.100
107	1500.0	2000.0	2500.0	0.100
108	1500.0	2000.0	4500.0	0.075
109	750.0	4500.0	1000.0	0.100
110	450.0	475.0	2000.0	0.050
111	400.0	500.0	1000.0	0.075
112	500.0	1000.0	1500.0	0.100
113	400.0	600.0	1500.0	0.090
114	750.0	1000.0	1200.0	0.125
115	500.0	1000.0	2000.0	0.200
116	500.0	700.0	1000.0	0.150
117	1000.0	1500.0	3000.0	0.075
118	350.0	500.0	750.0	0.100
119	300.0	450.0	500.0	0.100
120	350.0	450.0	800.0	0.080
121	240.0	290.0	320.0	0.140
122	500.0	1000.0	1000.0	0.100
123	200.0	400.0	500.0	0.055
124	500.0	1250.0	3000.0	0.050
125	300.0	400.0	700.0	0.100
126	500.0	800.0	1000.0	0.100
127	400.0	800.0	1200.0	0.050
128	400.0	1000.0	2500.0	0.075
129	350.0	550.0	1000.0	0.100
130	800.0	1500.0	1800.0	0.050
131	1000.0	1000.0	1500.0	0.100
132	500.0	650.0	1000.0	0.100
133	650.0	1000.0	1200.0	0.050
134	400.0	600.0	800.0	0.010
135	1000.0	2000.0	3000.0	0.100
136	500.0	500.0	1000.0	0.035
137	500.0	800.0	1000.0	0.100
138	1200.0	1200.0	3000.0	0.050
139	1000.0	1000.0	1000.0	0.125
140	750.0	1000.0	2500.0	0.050
141	500.0	1000.0	1500.0	0.150
142	700.0	800.0	2000.0	0.050
143	100.0	120.0	300.0	0.100
144	100.0	500.0	750.0	0.075
145	1000.0	1300.0	2000.0	0.050
146	500.0	1000.0	1200.0	0.150
147	600.0	700.0	1000.0	0.250
148	500.0	700.0	1200.0	0.050
149	600.0	600.0	2000.0	0.100
150	600.0	800.0	1500.0	0.050

FACTOR: PILOT EXPERIENCE (HOURS)

RESPONDANT	LOWER_LIMIT	FIFTIETH_UTILE	UPPER_LIMIT	WEIGHT
151	500.0	700.0	750.0	0.020
152	750.0	1000.0	1200.0	0.140
153	200.0	500.0	1000.0	0.150
154	200.0	300.0	500.0	0.100
155	600.0	700.0	1500.0	0.050
156	400.0	500.0	800.0	0.100
157	400.0	500.0	800.0	0.010
158	200.0	500.0	500.0	0.050
159	300.0	400.0	1500.0	0.050
160	1000.0	1000.0	4000.0	0.010
161	500.0	700.0	1500.0	0.050
162	1000.0	1250.0	1500.0	0.140
163	800.0	1000.0	1500.0	0.095
164	500.0	900.0	3000.0	0.050
165	200.0	600.0	1500.0	0.100
166	300.0	350.0	700.0	0.100
167	500.0	750.0	1500.0	0.125
168	250.0	500.0	1000.0	0.100
169	500.0	750.0	1000.0	0.200
170	750.0	1000.0	1250.0	0.025
171	300.0	400.0	500.0	0.110
172	1500.0	1600.0	2500.0	0.050
173	500.0	1000.0	2000.0	0.090
174	500.0	800.0	1500.0	0.100
175	200.0	250.0	1500.0	0.100
176	500.0	1000.0	200.0	0.150
177	400.0	400.0	600.0	0.100
178	750.0	1000.0	1500.0	0.040
179	800.0	1000.0	2000.0	0.080
180	500.0	1000.0	1500.0	0.100
181	1000.0	1500.0	2000.0	0.150
182	350.0	750.0	2000.0	0.150
183	300.0	375.0	600.0	0.150
184	300.0	600.0	1500.0	0.025
185	700.0	1000.0	2000.0	0.050
186	500.0	750.0	2000.0	0.100
187	500.0	1000.0	2000.0	0.100
188	500.0	500.0	3000.0	0.150
189	750.0	800.0	1000.0	0.100
190	700.0	1500.0	2000.0	0.100
191	500.0	1000.0	1500.0	0.150
192	1000.0	1500.0	2000.0	0.050
193	200.0	800.0	1400.0	0.100
194	500.0	1500.0	2500.0	0.150
195	500.0	800.0	1500.0	0.100
196	500.0	750.0	1000.0	0.050
197	500.0	1000.0	3200.0	0.025
198	400.0	500.0	700.0	0.095
199	500.0	600.0	1000.0	0.065
200	200.0	500.0	5000.0	0.100



GENERAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	5.189500E 02	VARIANCE	7.526144E 04	M3	2.563525E 07	MINIMUM	5.000000E 01
MEDIAN	5.000000E 02	STD DEV	2.743381E 02	M4	2.819976E 10	.10 QUANTILE	2.000000E 02
TRIMEAN	4.750000E 02	COEF VAR	5.286409E-01	SKEWNESS	1.241593E 00	.25 QUANTILE (HINGE)	3.000000E 02
MIDMEAN	4.730000E 02	MEAN DEV	1.895500E 02	KURTOSIS	1.978523E 00	.50 QUANTILE (MEDIAN)	5.000000E 02
MIDRANGE	7.750000E 02	RANGE	1.450000E 03	BETA1	2.525200E 07	.75 QUANTILE (HINGE)	6.000000E 02
GEOM MEAN	4.518176E 02	MIDSPREAD	3.000000E 02	BETA2	2.780443E 10	.90 QUANTILE	1.000000E 03
HARM MEAN	3.816917E 02					MAXIMUM	1.500000E 03

LOWER LIMIT FOR PILOT EXPERIENCE

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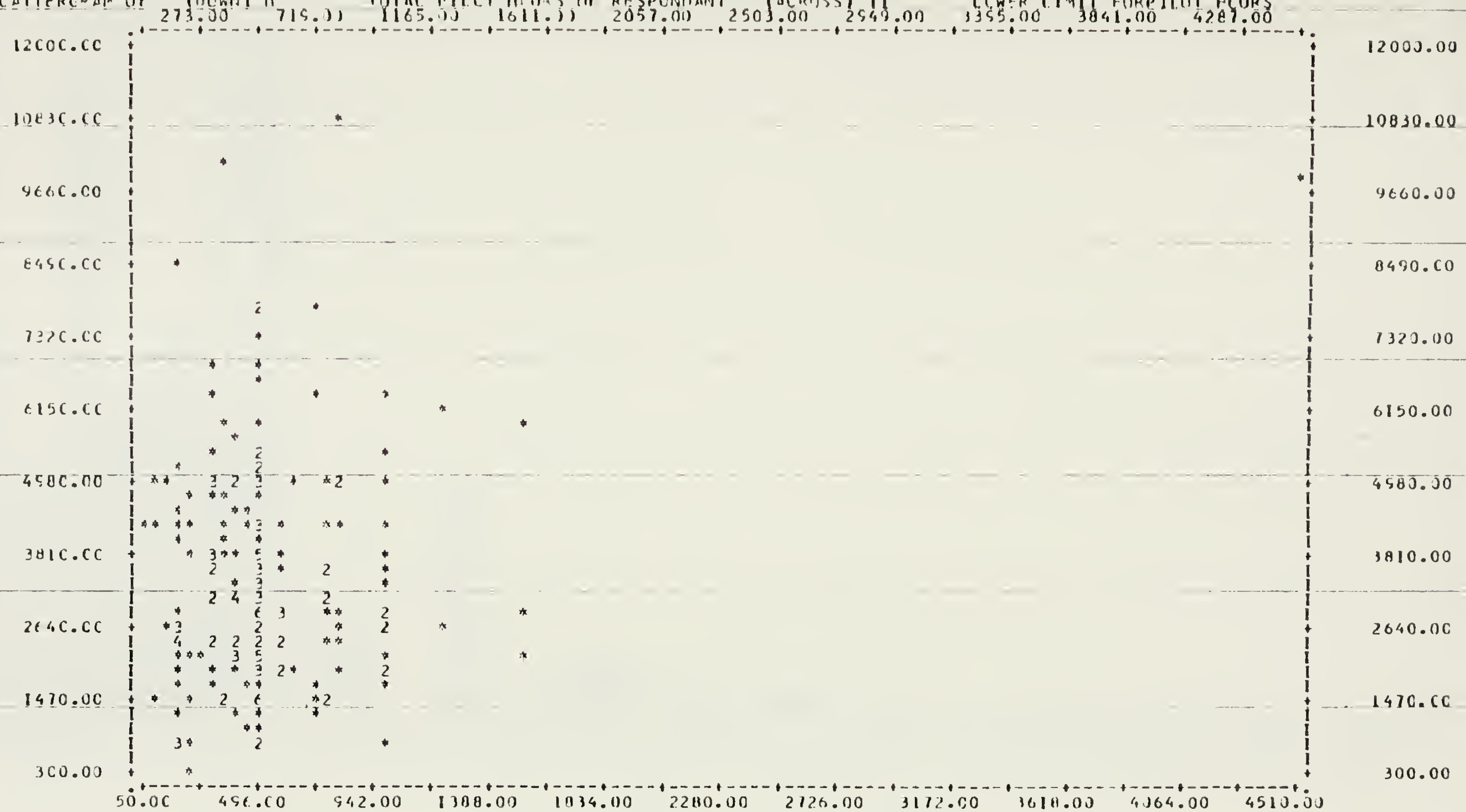
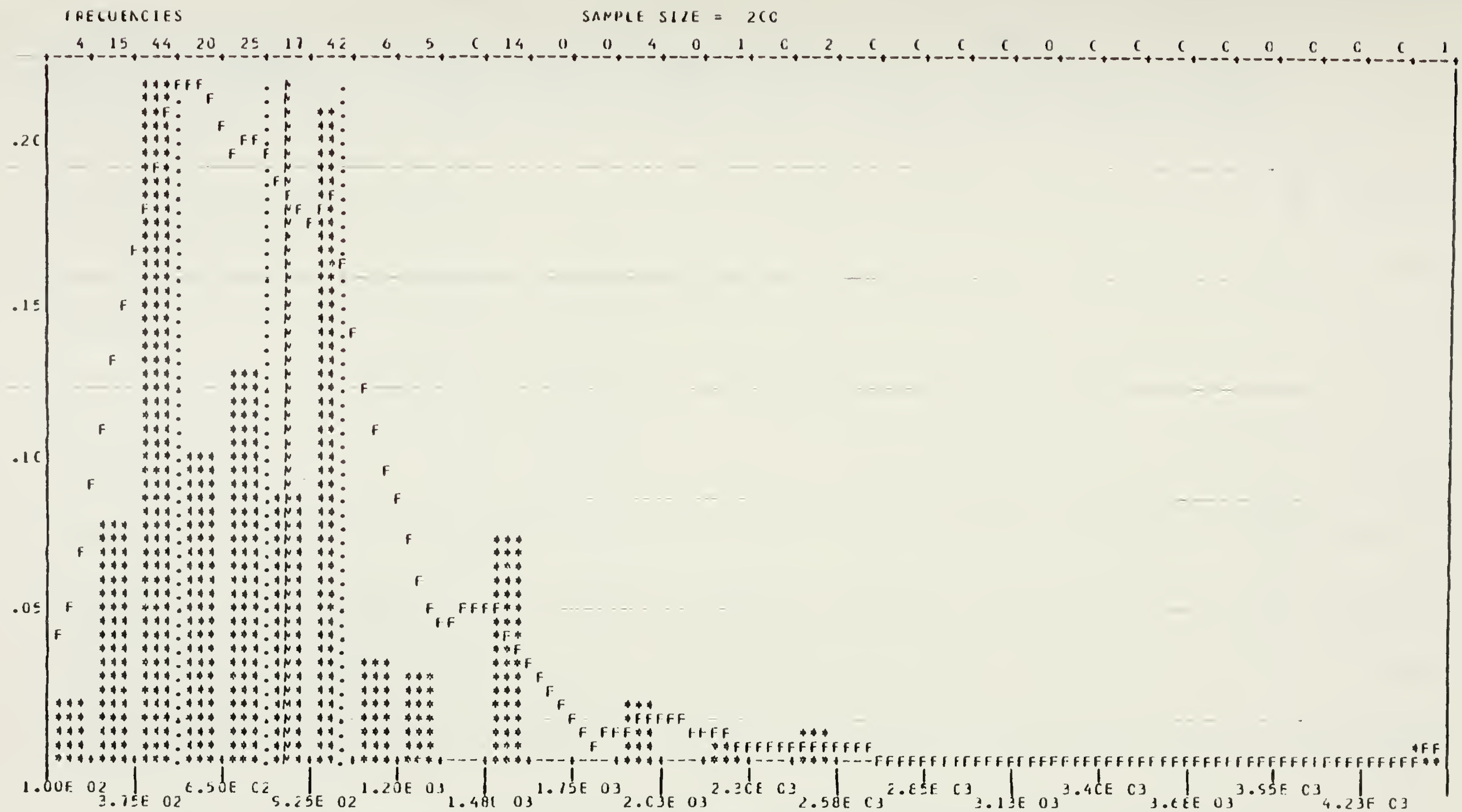
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) II TOTAL PILOT HOURS OF RESPONDANT (ACROSS) II LOWER LIMIT FORPILOT HOURS



STATISTICS..

CORRELATION (R)-	0.21163	R SQUARED -	0.04479	SIGNIFICANCE -	0.00135
STD ERR OF EST -	1770.99476	INTERCEPT (A) -	3018.33907	SLOPE (B) -	0.98647
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	8.3022COE C2	VARIANCE	2.463904E C5	M3	3.404E57E C8	MINIMUM	1.CCCCCOE C2
MEDIAN	7.5CCCCCE 02	STD DEV	4.963772F 02	M4	1.C9C747E 12	.1C QUANTILE	4.CCCCCCE C2
TRIMEAN	7.5CCCCCE 02	COEF VAR	5.97E791E-01	SKEWNESS	2.7825S6E CC	.25 QUANTILE (HINGE)	5.CCCCCCF C2
MIDMEAN	7.550SS9E 02	MEAN DEV	3.307598E 02	KURTOSIS	1.4567C3E 01	.50 QUANTILE (MEDIAN)	7.5CCCCCE 02
MIDRANGE	2.3CCCCCE C3	RANGE	4.4000COE 03	BETA1	3.353554E C8	.75 QUANTILE (HINGE)	1.CCCCCCE C3
GEOM MEAN	7.1E6531E 02	MIDSPREAD	5.COCCOOE 02	BETA2	1.C7C741F 12	.9C QUANTILE	1.5CCOCOE 03
HARM MEAN	6.14E457E 02					MAXIMUM	4.5CCCCCF C3

FIFTIETH UTILE FOR PILOT EXPERIENCE

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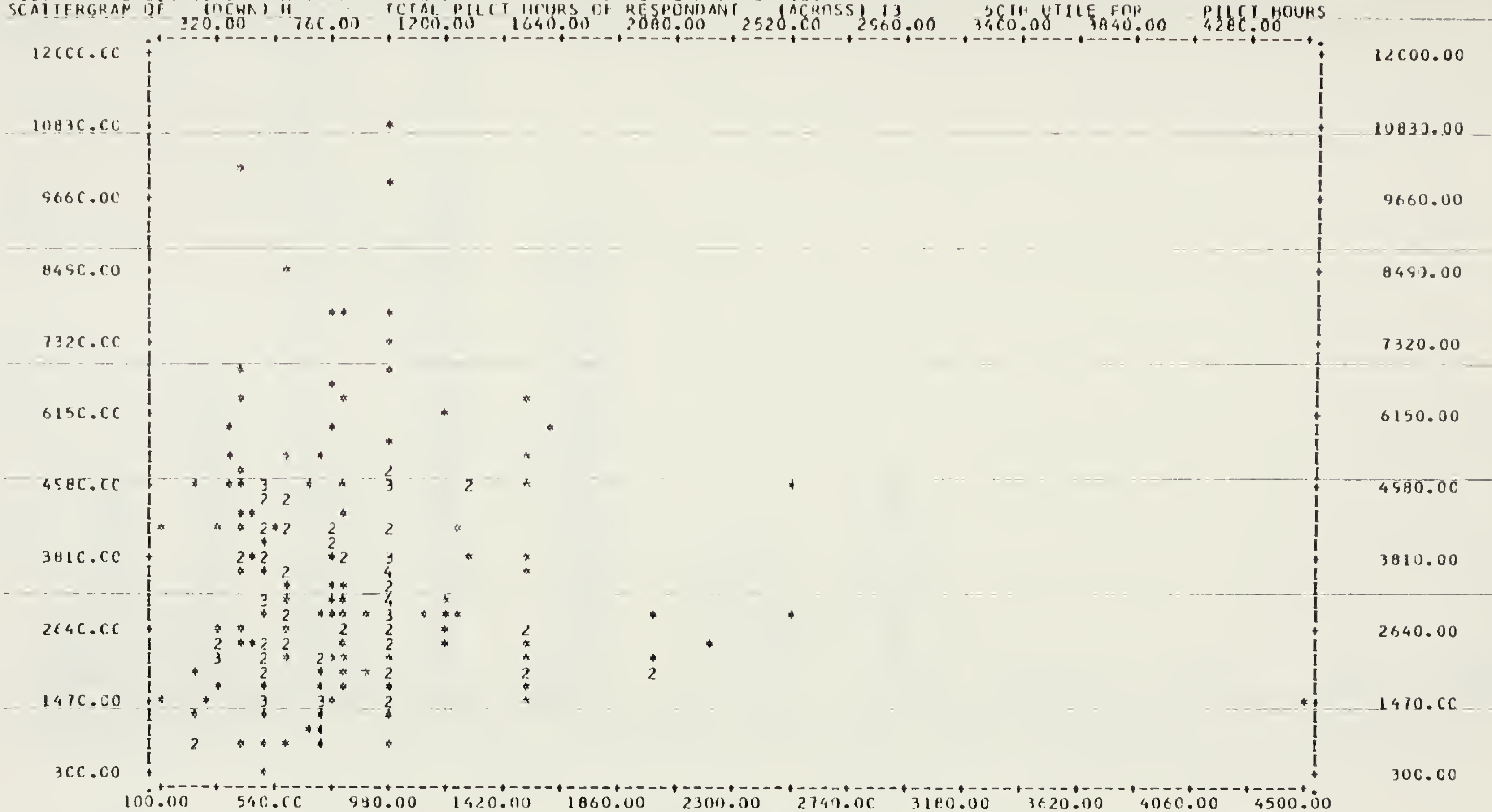
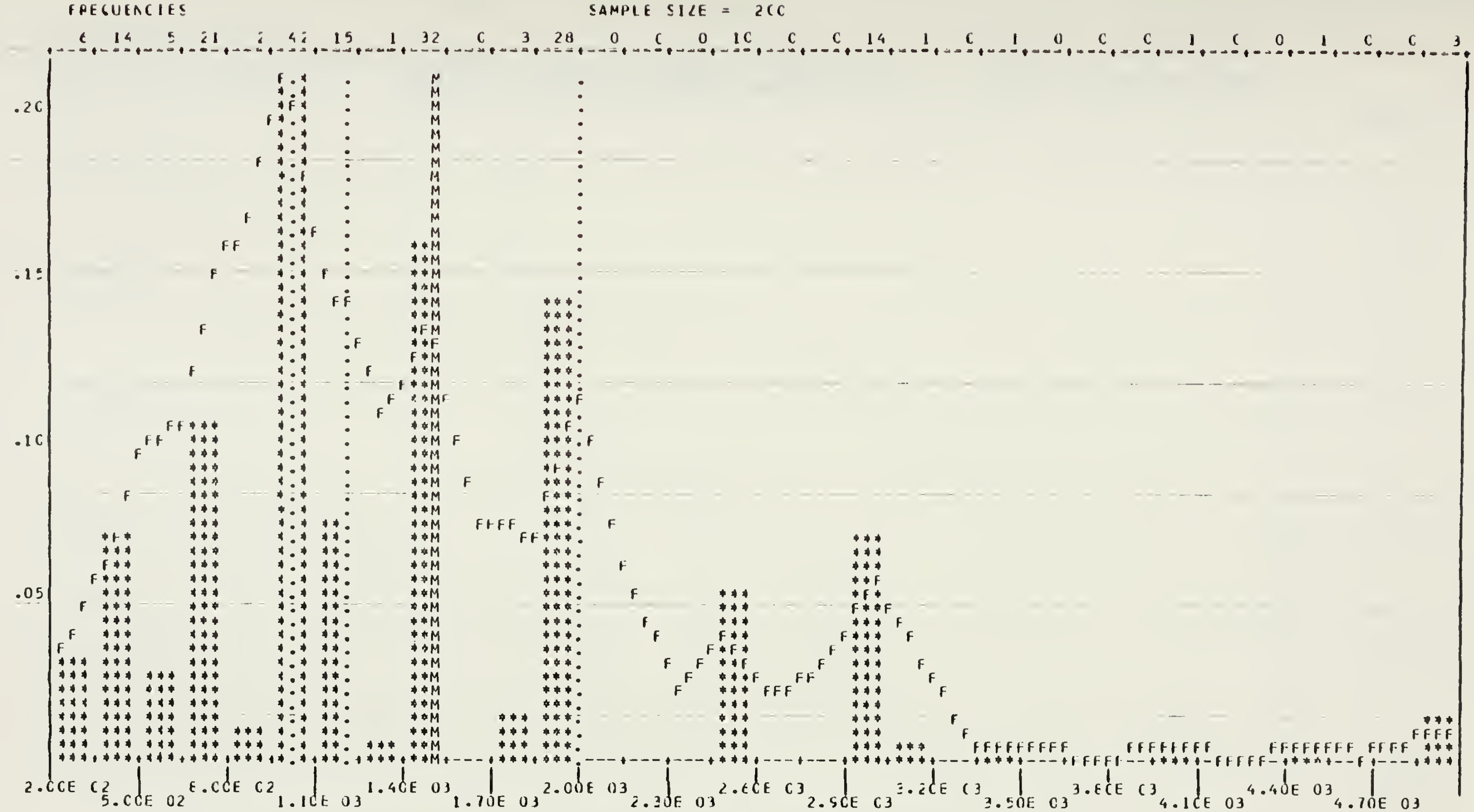
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) 13 50TH UTILE FOR PILOT HOURS



STATISTICS..

CORRELATION (R)-	-0.01614	R SQUARED -	0.00026	SIGNIFICANCE -	0.41051
STD ERR OF EST -	1611.80281	INTERCEPT (A) -	3592.31986	SLOPE (B) -	-0.05863
PLOTTED VALUES -	159	EXCLUDED VALUES-	1	MISSING VALUES -	0



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.4862000E 03	VARIANCE	7.987623E 05	M3	1.051803E 09	MINIMUM	2.0000000E 02
MEDIAN	1.2000000E 03	STD DEV	8.937351E 02	M4	3.700778E 12	.10 QUANTILE	5.0000000E 02
TRIMEAN	1.3500000E 03	COEF VAR	6.013559E-01	SKEWNESS	1.472357E 00	.25 QUANTILE (HINGE)	1.0000000E 03
MIDMEAN	1.3090000E 03	MEAN DEV	6.532598E 02	KURTOSIS	2.800401E 00	.50 QUANTILE (MEDIAN)	1.2000000E 03
MIDRANGE	2.6000000E 03	RANGE	4.8000000E 03	BETA1	1.036079E 09	.75 QUANTILE (HINGE)	2.0000000E 03
GEOM MEAN	1.254507E 03	MIDSPREAD	1.0000000E 03	BETA2	3.645761E 12	.90 QUANTILE	2.9500000E 03
HARM MEAN	1.037173E 03					MAXIMUM	5.0000000E 03

UPPER LIMIT FOR PILOT EXPERIENCE

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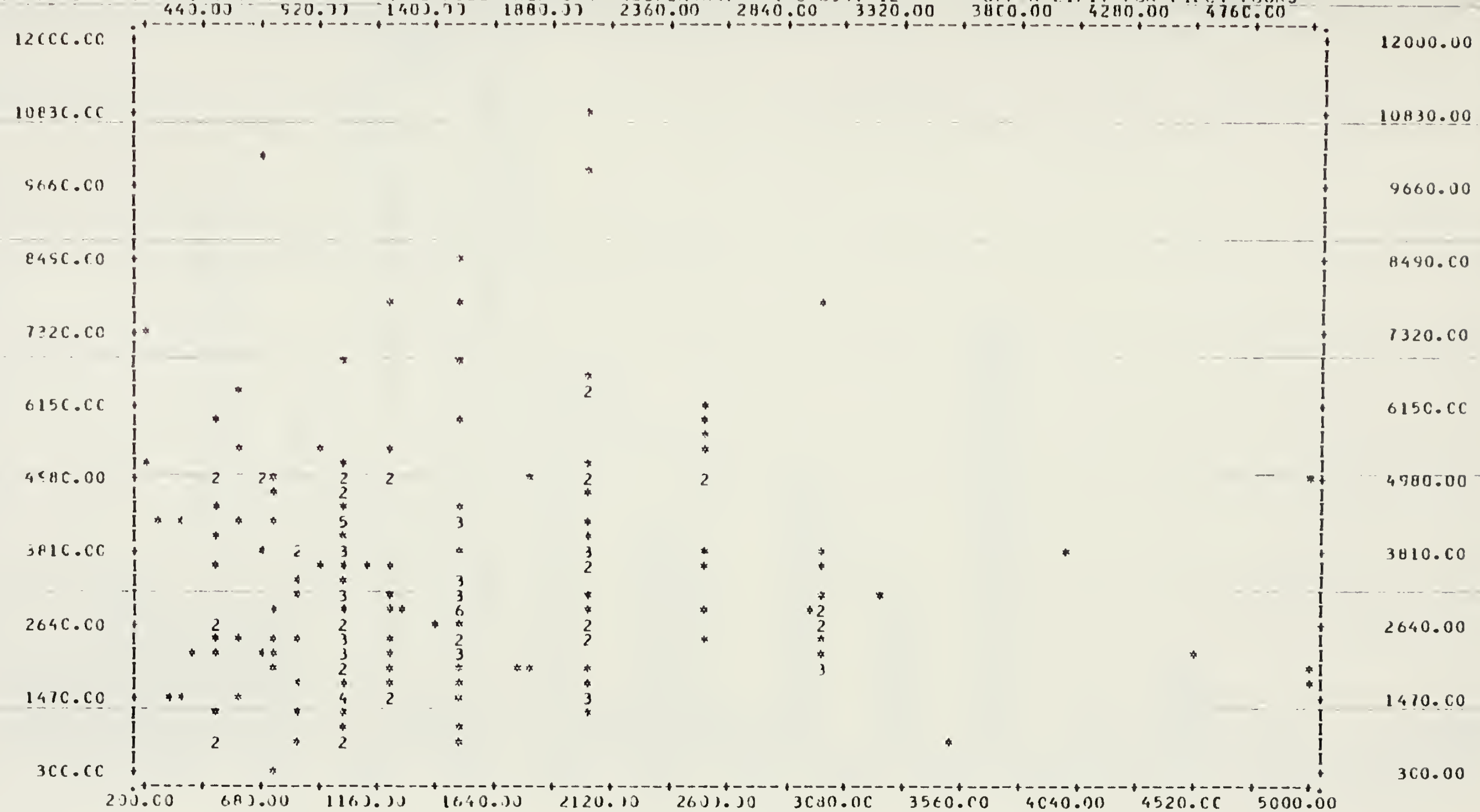
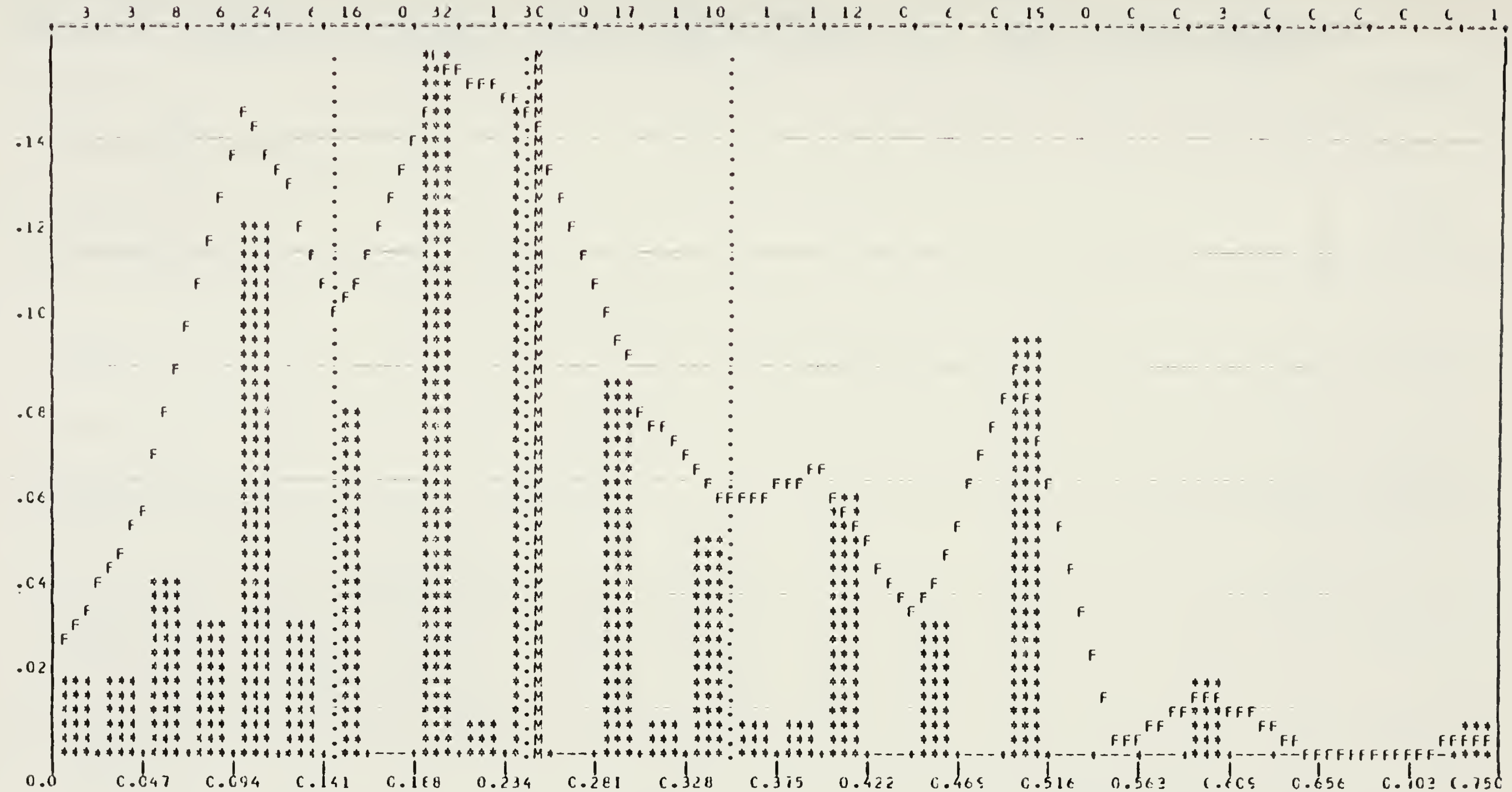
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) I2 UPPER LIMIT FOR PILOT HOURS



STATISTICS..

CORRELATION (R)-	0.00632	R SQUARED -	0.00004	SIGNIFICANCE -	0.46472
STD ERR OF EST -	1812.00261	INTERCEPT (A) -	3524.73193	SLOPE (B) -	0.01275
PLOTTED VALUES -	159	EXCLUDED VALUES-	1	MISSING VALUES -	0

FREQUENCIES   SAMPLE SIZE = 200



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	2.455999E-01	VARIANCE	2.094803E-02	M3	1.552623E-03	MINIMUM	0.0
MEDIAN	2.449999E-01	STD DEV	1.447371E-01	M4	1.259450E-03	.10 QUANTILE	8.999997E-02
TRIMEAN	2.462499E-01	COEF VAR	5.798764E-01	SKEWNESS	6.435090E-01	.25 QUANTILE (HINGE)	1.450000E-01
MIDMEAN	2.254999E-01	MEAN DEV	1.151500E-01	KURTOSIS	-1.300440E-01	.50 QUANTILE (MEDIAN)	2.449999E-01
MIDRANGE	3.750000E-01	RANGE	7.500000E-01	BETA1	1.523431E-03	.75 QUANTILE (HINGE)	3.500000E-01
		MIDSPREAD	2.050000E-01	BETA2	1.241367E-03	.90 QUANTILE	5.000000E-01
						MAXIMUM	7.500000E-01

WEIGHT GIVEN TO PILOT EXPERIENCE

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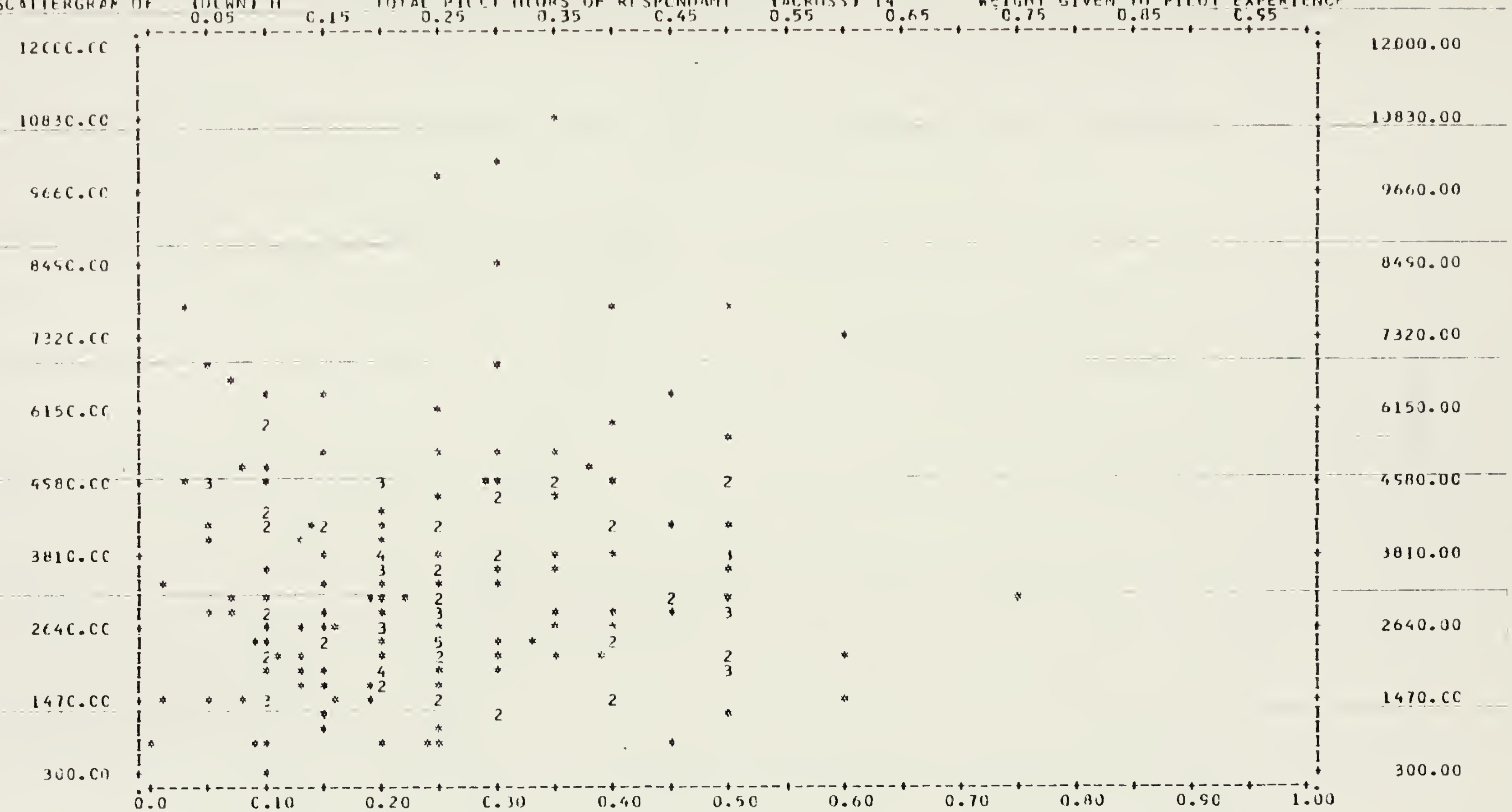
FILE ANALYSIS (CREATION DATE = 07/26/77) OF THE LARGE SAMPLE SURVEY

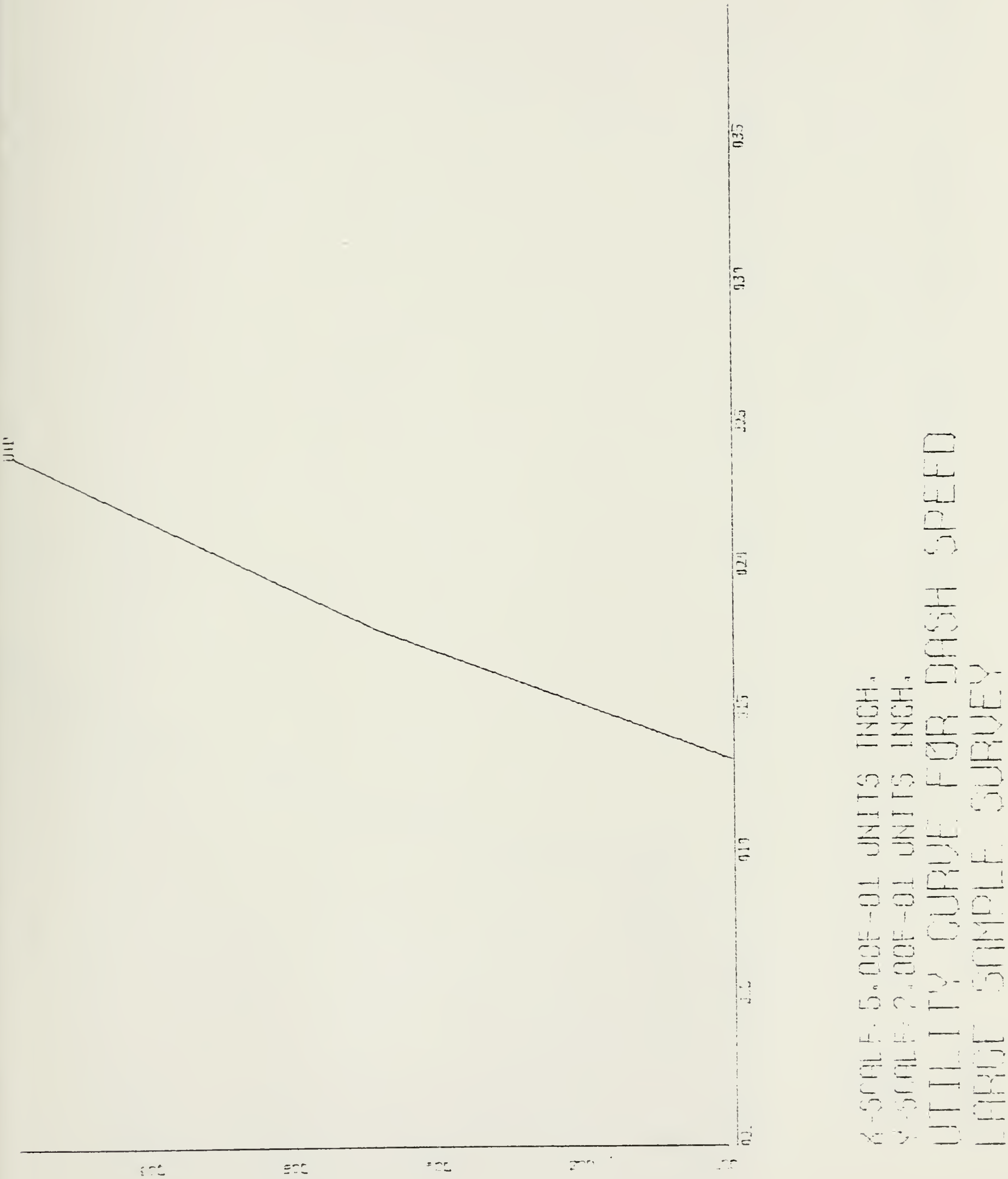
SCATTERGRAM OF (DOWN) H TOTAL PILOT HOURS OF RESPONDANT (ACROSS) I4 WEIGHT GIVEN TO PILOT EXPERIENCE



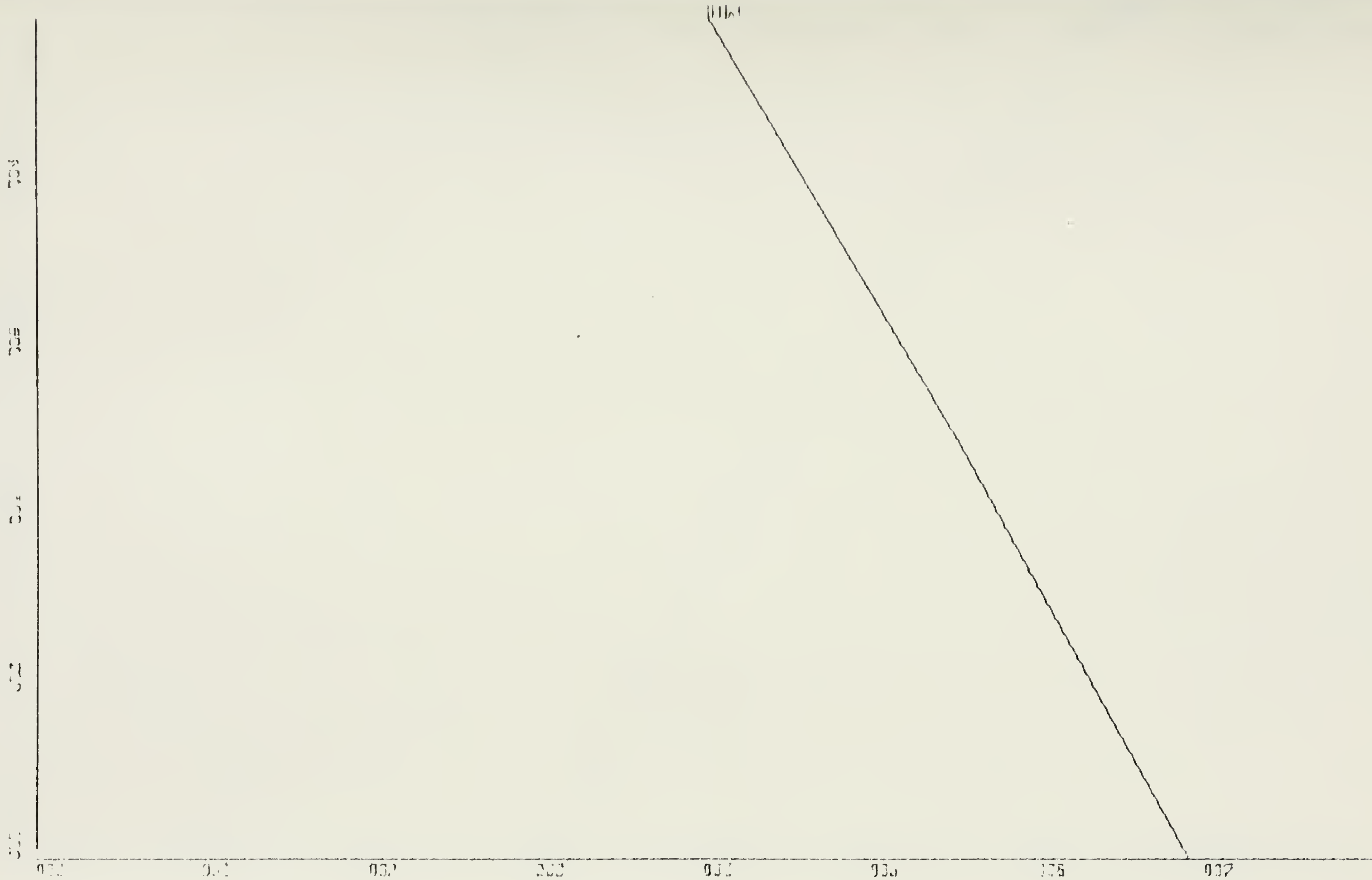
STATISTICS..

CORRELATION (R)-	0.07361	R SQUARED -	0.00542	SIGNIFICANCE -	0.15075
STD ERR OF EST -	1807.12314	INTERCEPT (A) -	3314.53596	SLOPE (B) -	917.16714
PLOTTED VALUES -	199	EXCLUDED VALUES-	1	MISSING VALUES -	0

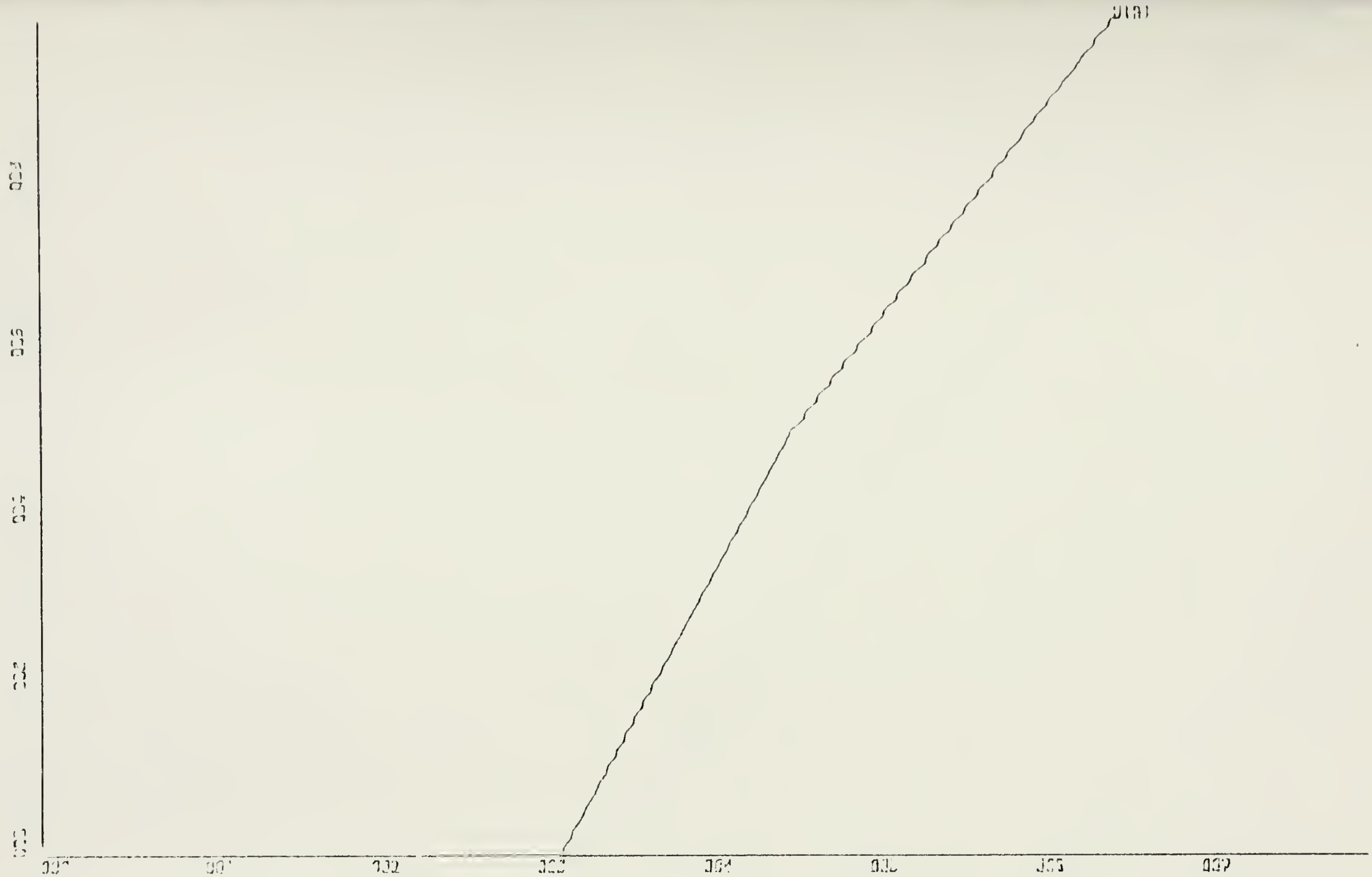
APPENDIX F


X-SCALE 5.00E-01 UNITS INCH.
Y-SCALE 2.00E-01 UNITS INCH.
UTILITY CURVE FOR DASH SPEED
LARGE SAMPLE SURVEY

X-SCALE=5.00E-01 UNITS INCH.
Y-SCALE=2.00E-01 UNITS INCH.
UTILITY CURVE FOR THRUST-WEIGHT (WEIGHT = 1.00)
LARGE SAMPLE SURVEY

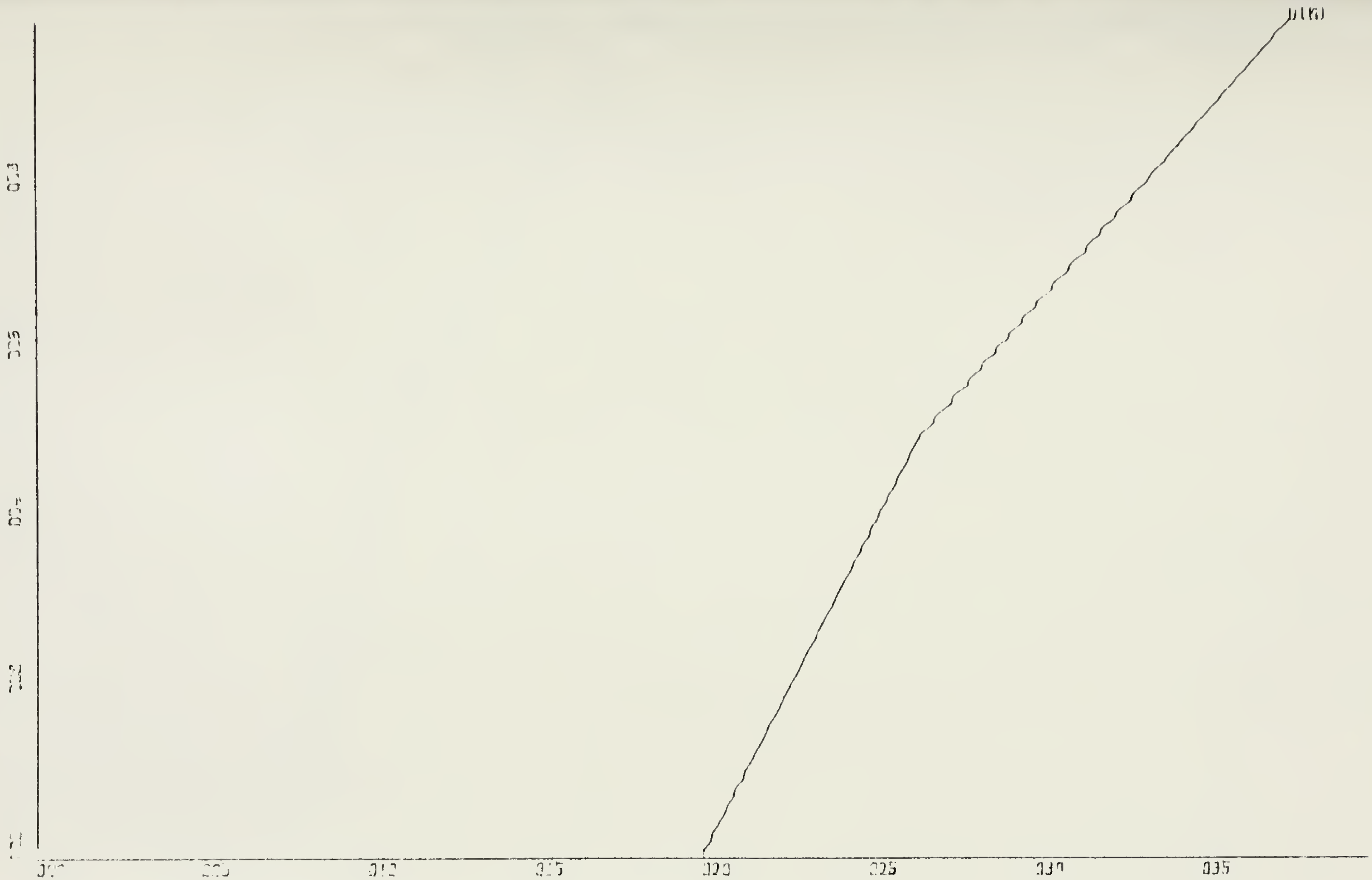


X-SCALE=1.00E+01 UNITS INCH.
Y-SCALE=2.00E-01 UNITS INCH.
UTILITY CURVE FØR WING LØADING
LARGE SAMPLE SURVEY



X-SCALE 1.00E+02 UNITS INCH.
Y-SCALE 2.00E-01 UNITS INCH.
UTILITY CURVE FOR COMBAT RADIUS
LARGE SAMPLE SURVEY

X-SCALE 1.00E+00 UNITS INCH.
Y-SCALE 2.00E-01 UNITS INCH.
UTILITY CURVE FØR NØ. OF GUN BARRELS
LARGE SAMPLE SURVEY



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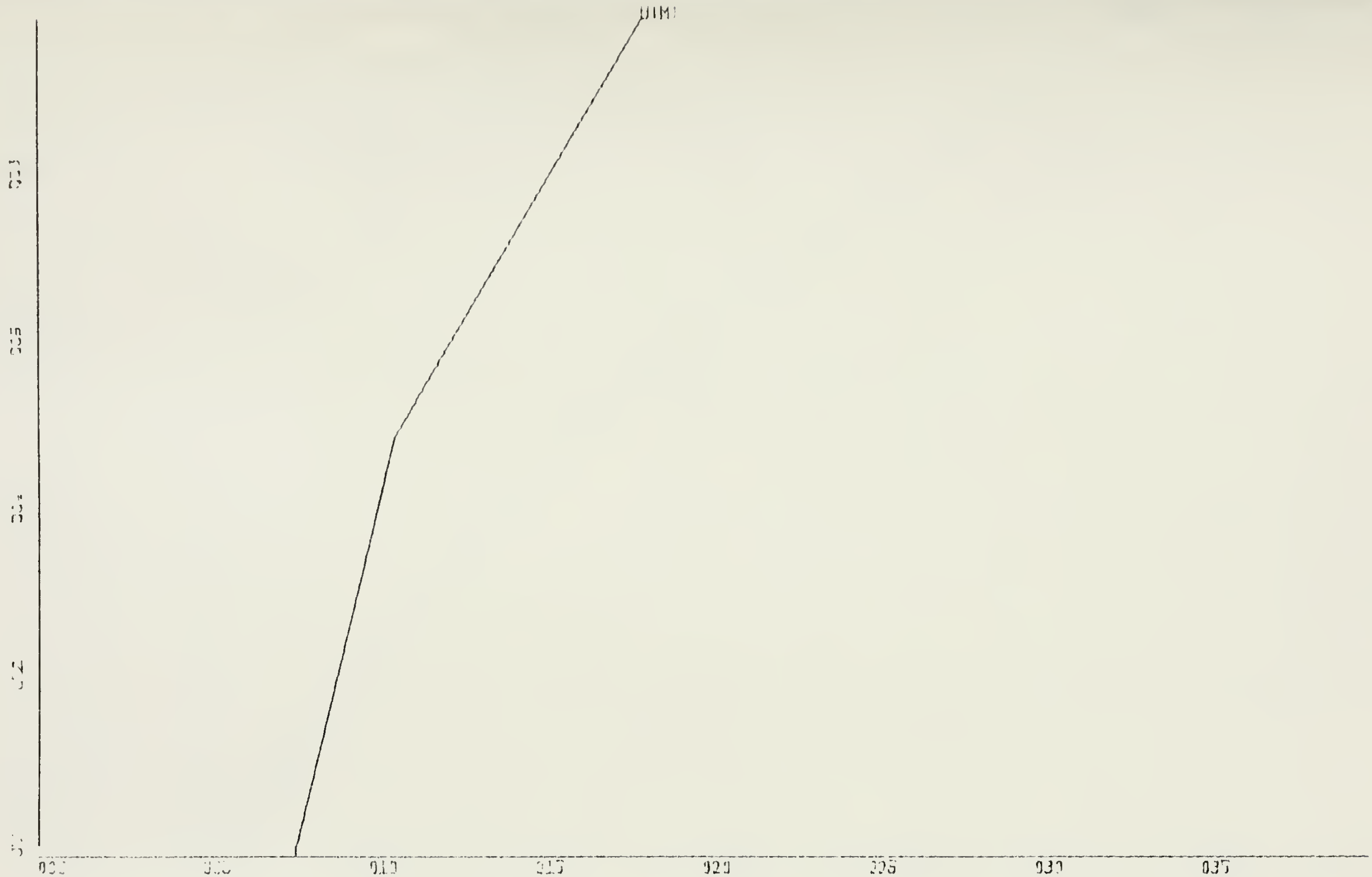
Y-SCALE=2.00E-01 UNITS INCH.

UTILITY CURVE FOR MISSILE SPEED
LARGE SAMPLE SURVEY



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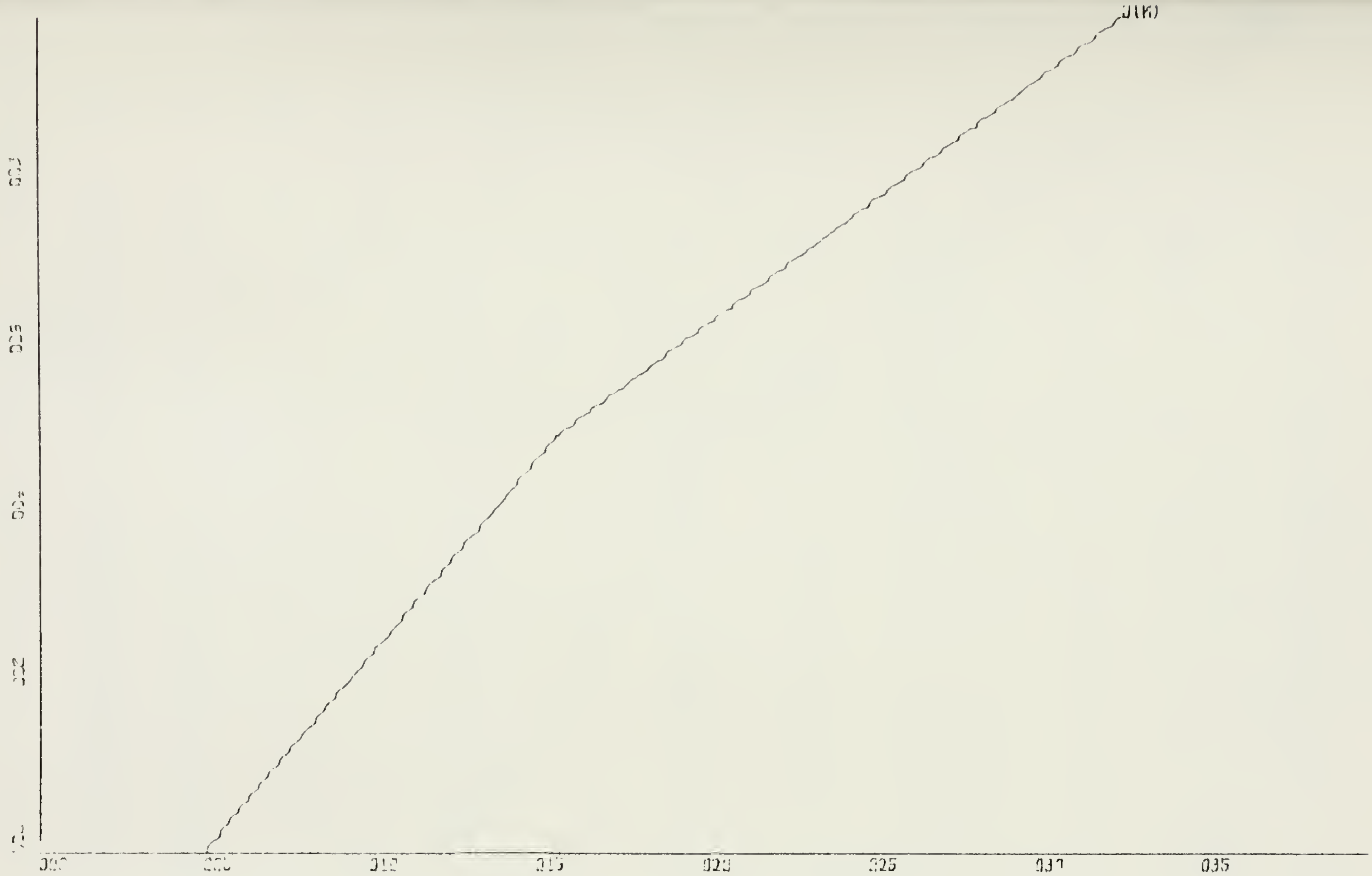
UTILITY CURVE FØR MISSILE ANGLE ØFF CAPABILITY
LARGE SAMPLE SURVEY



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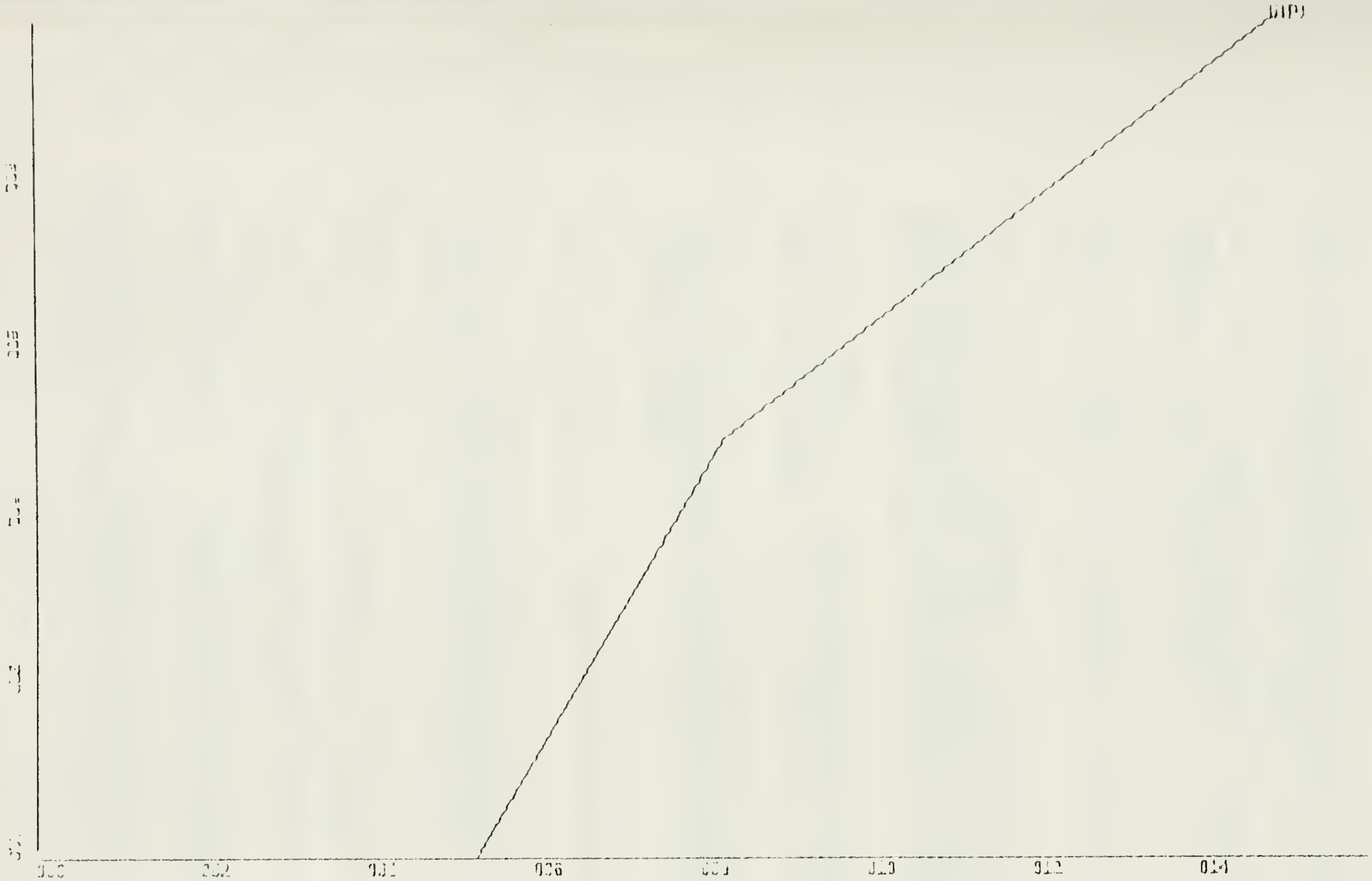
UTILITY CURVE FOR MISSILE RANGE
LARGE SAMPLE SURVEY



X-SCALE=2.00E+02 UNITS INCH.
Y SCALE=2.00E-01 UNITS INCH.
UTILITY CURVE FOR PILOT EXPERIENCE
LARGE SAMPLE SURVEY

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